METAL INDUSTRY

WITH WHICH ARE INCORPORATED

ALUMINUM WORLD ▲ COPPER AND BRASS

BRASS FOUNDER and FINISHER

ELECTRO-PLATERS REVIEW

VOL. 30 NEW YORK, MARCH, 1932 NO. 3

Institute of Metals Division Meeting

Papers on Various Alloys, Gases in Metals and Theoretical Metallurgy. Lectures on Magnesium and Age Hardening. Honors Awarded to Metals Division Members.

THE Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers, held its annual New York meeting at the Engineering Building, 29 West 39th Street, on February 15-18.

The meetings were as usual, well attended and a number of events of considerable interest occurred.

Honors Awarded

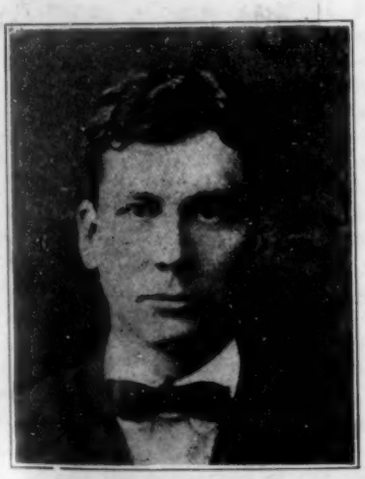
The **James Douglas medal** of the A.I.M.E. was awarded to **Dr. C. H. Mathewson**, Professor of Metallurgy, Yale University.

Dr. P. D. Merica, vice-president of the International Nickel Company, New York, was elected vice-president of the main body of the A.I.M.E. Dr. Merica also delivered the annual lecture of the Institute of Metals Division, on the subject of Age Hardening.

The annual dinner of the Division, held Tuesday evening, February 16, at the Hotel Commodore, marked the 25th anniversary of the founding of the organization which eventually grew into the Institute.

New Officers

New officers and the new members of the Executive Committee were elected as follows:



Dr. C. H. MATHEWSON

Professor of Metallurgy, Yale University, Chairman, Institute of Metals Division. James Douglas Medallist, A. I. M. E.

W. A. SCHEUCH

Works Manager, Tottenville Copper Company, Tottenville, S. I., N. Y. Vice-Chairman, Institute of Metals Division.

T. S. FULLER

Metallurgist, General Research Laboratories, Schenectady, N. Y. Vice-Chairman, Institute of Metals Division.

Chairman: Dr. C. H. Mathewson, Professor of Metallurgy, Hammond Laboratory, Yale University, New Haven, Conn.

Vice-Chairmen: W. A. Scheuch, works manager, Tottenville Copper Company, Staten Island, N. Y.

T. S. Fuller, metallurgist, Research Laboratory, General Electric Company, Schenectady, N. Y.

Secretary-Treasurer: W. M. Corse, Consulting Metallurgical Engineer, Washington, D. C.

E. M. WISE

Metallurgist, International Nickel Company, Bayonne, N. J. Member, Executive Committee.

E. H. DIX

Metallurgist, Aluminum Research Laboratories, New Kensington, Pa. Member, Executive Committee.

J. W. SCOTT

Metallurgical Engineer, Western Electric Company Hawthorne, Chicago, Ill. Member, Executive Committee.

Members of Executive Committee, to serve three years:

E. H. Dix, metallurgist, Aluminum Research Laboratories, Aluminum Company of America, New Kensington, Pa.

J. W. Scott, metallurgical engineer, Western Electric Company, Hawthorne, Chicago, Ill.

E. M. Wise, metallurgist, International Nickel Company, Bayonne, N. J.

Development of Magnesium

At the annual dinner of the Division, the speaker was **Dr. J. A. Gann** of the Dow Chemical Company, Midland, Mich. Dr. Gann described the development of the manufacture of magnesium and magnesium alloys as it was carried on by the Dow company. It has now become one of our important metals, with a wide field before it because of its weight (30 per cent lighter than aluminum). It is one of the most abundant of engineering metals in the earth's crust, being surpassed in quantity only by aluminum and iron. Dr. Gann described vividly, the difficulties and hardships, metallurgical, electrical, mechanical, and financial, encountered by his organization and how they overcame them. Magnesium is now produced in all forms—cast, fabricated and alloyed, in commercial quantities and ready for engineering use.

W. M. CORSE

Consulting Metallurgical Engineer, Washington, D. C. Secretary-Treasurer, Institute of Metals Division for nearly 25 years.

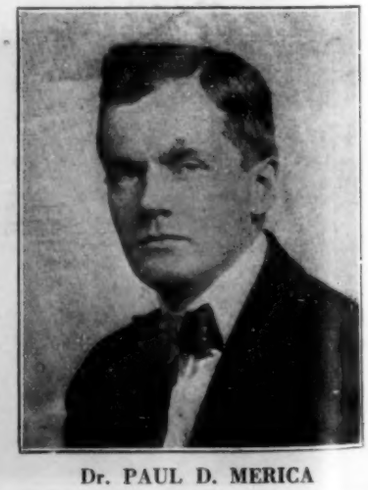
Age Hardening

The lecture by Dr. P. D. Merica covered the subject of Age Hardening of Metals. Many metals and alloys hitherto mechanically inferior to steel may now be brought up to the standard of steel, as far as mechanical properties are concerned, through the development within the past decade of age-hardening. As a result, the sphere of usefulness of the non-ferrous metals will be widened.

"Until comparatively recently," Dr. Merica said, "steel has been practically the only metal which could be hardened, and strengthened, by heat-treatment. It is for this reason, as well as because of its cheapness, that it has become such an indispensable material of construction.

"The non-ferrous metals—copper, lead, zinc, nickel, aluminum, tin—which are in many respects superior to steel, because of their corrosion resistance and electrical properties, have had limited usefulness in the past because of their mechanical inferiority to steel and because it has not been possible to improve their mechanical properties by heat-treatment.

"During the past ten years, however, the metallurgist's power to apply heat-treatments usefully in the hardening of non-ferrous metals has been substantially



Dr. PAUL D. MERICA

Vice-President, International Nickel Company, New York. Vice-President A. I. M. E. Annual lecturer for 1930 for the Institute of Metals Division.

broadened, through his understanding of the basic principles of 'age' or 'precipitation' hardening. All of the common metals may now be alloyed in such a manner as to render them susceptible to age-hardening. Copper, for example, may be hardened to about 400 Brinell, a value comparable with that of spring steel. Copper-nickel alloys may be heat-treated to exhibit tensile strengths in the neighborhood of 175,000 pounds per square inch, also comparable with the strength of heat-treated steel."

Explaining the process of age-hardening, Dr. Merica said:

"After certain heat treatments, these age-hardening alloys harden as they grow older. Sometimes they age, or age-harden, at room temperatures; sometimes they must be aged at higher temperatures. A single day is often adequate to bring about the desired changes in mechanical properties, although slight changes may continue for a month.

"What happens is that there is generated or precipitated throughout the metal or alloy a host of extremely fine, sub-microscopic particles of a hardening constituent. This flock of very fine particles—each less than 1/100,000 of an inch in diameter—is uniformly distributed throughout the matrix of the metal and hardens it.

"These particles are manufactured from the metal or alloy itself. Certain of the atom constituents of the metal or alloy segregate and then separate from the parent metal, during the process, to form the tiny particles.

"The significance of this development in the metal field is that it is now potentially within our power to harden practically any metal or alloy we please, and thus to put these formerly soft and weak metals and alloys on a comparable footing with steel as regards mechanical properties. The next decade will undoubtedly witness a substantial realization of our promise in this respect."

Abstracts of Papers Read

EQUILIBRIUM RELATIONS IN ALUMINUM-COPPER-MAGNESIUM AND ALUMINUM-COPPER-MAGNESIUM SILICIDE ALLOYS

By E. H. Dix, Jr., G. F. Sager and B. P. Sager, Aluminum Research Laboratories, New Kensington, Pa.

A series of investigations has been in progress in the Research Laboratories of the Aluminum Company of America to determine the functions of small amounts of magnesium silicon, manganese and iron in aluminum alloys of the Duralumin type. The present investigation was undertaken to determine the individual effects of small contents of aluminum and magnesium silicide with special reference to the effect on the solubility of copper.

The authors investigated the aluminum-copper-magnesium system and the aluminum-copper-magnesium-silicide system. The results of the examinations are shown graphically.

EQUILIBRIUM RELATIONS IN ALUMINUM-COBALT ALLOYS OF HIGH PURITY

By William L. Fink and H. R. Freche, Metallurgical Division, Aluminum Research Laboratories, New Kensington, Pa.

This investigation of the aluminum end of the aluminum-cobalt system is the 11th of a series dealing with the constitution of aluminum-rich alloys, prepared from electrolytically refined aluminum. A diagram is presented of the zero to 8 per cent cobalt end of this series and the solid solubility of cobalt in aluminum, determined.

COPPER-BERYLLIUM "BRONZES"

By J. Kent Smith, Consulting Metallurgist, Beryllium Development Corporation, New York, N. Y.

The object of this investigation was to ascertain the effect of varying percentages of beryllium upon pure copper and the properties of the resultant alloys in their softest condition, the effect of heat hardening on them, and the extents to which these properties could be augmented by different combinations of heat hardening and cold rolling. The data compiled in this paper represent partial results of continuing work done by the writer during the years 1930 and 1931, which was a continuation of the unpublished ground work incepted in the laboratory of the Beryllium Corporation of America by H. B. Pulsifer in the year 1926. A short bibliography on Beryllium alloys is appended to this paper.

It has, of course, long been known that copper subjected to cold work is hardened and strengthened to a considerable extent, furthermore it had been qualitatively noted in previous experiments that copper-beryllium alloys seemed to take on hardness and strength as the result of cold work at a greater rate even than does plain copper. It was decided therefore to endeavor quantitatively to determine such rate of increase, as also the relative increases by combinations of cold working and heat hardening. The results are summarized.

VARIATIONS IN MICROSTRUCTURE INHERENT IN PROCESSES OF MANUFACTURING EXTRUDED AND FORGED BRASS

By Ogden B. Malin, Assistant Professor of Metallurgical Engineering, Pennsylvania State College, Pa.

1. Slugs from the front ends of extruded brass rods of 57 to 60 per cent Cu content have a much coarser grain structure than those from the rear end of the same rods.
2. The front ends of elongated forgings of the same compositions have a coarser grain than the rear end of the same forgings.
3. The forgings made from the front slugs cut from an extruded rod have a coarser grain than the forgings made from slugs cut from the rear end of the same rod.
4. Variations in chemical compositions between 57 to 60 per cent Cu have little effect upon grain size of extruded rods or forgings made therefrom.
5. Small amounts of aluminum (0.08 to 0.16 per cent) added to brasses of 57 to 60 per cent Cu have no visible effect upon the microstructure. These additions have been found to cause the metal to fill out the die more fully.
6. Factory practice has shown that fine-grained structures are more difficultly machined than coarse-grained structures of the same chemical composition.

EFFECT OF SMALL PERCENTAGES OF CERTAIN METALS UPON THE COMPRESSIBILITY OF LEAD AT AN ELEVATED TEMPERATURE

By Lyall Zickrick, Research Laboratory, General Electric Company, Schenectady, N. Y.

In lead cable-sheath extrusion different leads require different pressures. These compression tests on various brands of virgin pig lead and different alloys tested at 200° C., disclose the following:

When at a temperature of 200° C. the softest leads are those of highest purity, both copper-free and bismuth-free. Southeastern Missouri lead, not desilverized and containing copper, requires a greater deformation pressure than a desilverized bismuth lead.

Copper alloyed with high-purity lead causes a rapid increase in deformation pressure up to 0.08 per cent copper. Copper present in larger amounts does not appreciably increase the deformation pressure.

Bismuth alloyed with high-purity lead causes a gradual increase in deformation pressure.

Tin and antimony increase the deformation pressure of either a high-purity lead or a copper-bearing lead to about the same value.

SURFACE EFFECTS ON ASSAY BEADS CAUSED BY METALS OF THE PLATINUM GROUP

By J. L. Byers, Instructor in Metallurgy, Michigan College of Mining and Technology, Houghton, Mich.

1. The possibility of the often unnoticed presence of the platinum metals, of which the value to industry has been increasing, makes obvious the need of a microscopic examination of all cupellation beads as a part of routine assaying, and a statement, in all assay reports, of the indication or lack of indication of the presence of the platinum group as shown by the microscope.

2. A more thorough analysis for the platinum metals should be made of all beads showing any indication of the presence of precious metal. If the bead from an ordinary charge indicates the presence of any of the platinum group the assay should be repeated, the charge being made sufficiently large to produce a cupellation bead of magnitude great enough for comparative observation.

THE ROLE OF THE PLATINUM METALS IN DENTAL ALLOYS

By E. M. Wise,* Bayonne, N. J., Walter S. Crowell,† Philadelphia, Pa., and J. T. Eash,‡ Bayonne, N. J.

A careful survey has been made of the tensile properties of two series of quarternary alloys, containing gold, silver, copper, and either platinum or palladium, to determine definitely the properties that can be developed by the application of judicious and other heat treatments. This work has led to the following conclusions:

1. The general nature of the age-hardening transformation is much the same whether the hardening agent is Au-Cu, Pd-Cu or Pt-Cu.

2. The introduction of either platinum or palladium, particularly the former, results in a considerable increase in solid solution hardness, and at the same time permits the multiplication of the strength through age-hardening by substantially the same ratios as those obtainable with the weaker gold-silver copper alloys. The increase in strength resulting from the introduction of platinum or palladium is accompanied by a marked increase in melting point, while the increase in strength resulting from the addition of further quantities of base-metal hardeners such as copper and zinc occasions not only a decrease in melting point but also a rather serious loss in nobility.

3. The aging temperature required to produce the maximum strength in a definite time interval has been determined for each of the alloys. For 15-min. treatments this temperature is 300° C. for the gold-base alloy free from platinum or palladium, while it rises to about 450° C. in alloys containing large percentages of either platinum or palladium.

4. It has been demonstrated that by the introduction of the proper quantities of platinum or palladium, alloys can be produced which will develop excellent properties in spite of a considerable deviation from the optimum age-hardening temperature. In other words, such alloys possess a broad hardening range and are reasonably foolproof.

5. The results obtained by quenching from 700° C. and oven-cooling are compared with those obtained by aging at fixed temperatures, and the superiority of the fixed temperature-aging treatment is demonstrated. This superiority is particularly evident with the palladium-content alloys.

6. The influence of quenching temperature upon the properties of the platinum-content alloys was investigated, and the great increase in strength that can be secured by this means in alloys of high platinum content is demonstrated.

7. The rates of hardening in alloys containing platinum and those containing palladium are compared, and the somewhat higher rate characteristic of platinum is shown.

8. The domain of the hardenable high-strength white alloys is indicated.

9. The economies resulting from the replacement of considerable quantities of gold by either platinum or palladium are indicated, and it is shown that savings in metal cost as high as 40 per cent can be secured by this means.

SOME METALLURGICAL CHARACTERISTICS OF INDUCTION FURNACES AS DETERMINED BY THE ABSORPTION OF OXYGEN BY MOLTEN NICKEL

By F. R. Hensel,* Pittsburgh, Pa., and J. A. Scott,† Harrison, N. J.

1. Herty's aluminum method slightly modified was found to be a very suitable means for determining the nickel oxide content in nickel.

2. An electrolytic method of determining Al_2O_3 in nickel was worked out.

3. The solubility temperature relations for nickel oxide in molten nickel were determined approximately. It was found that the solubility of nickel oxide increased with the temperature.

4. Comparative tests on the rate of oxygen absorption as effected by turbulence were made in a 60-cycle and a 5,000-cycle furnace. The absorption of nickel oxide in nickel was found to be an increasing function of turbulence, time and temperature.

5. The rate of oxygen pick-up in the 60-cycle furnace is approximately three times as great as in the 5,000-cycle furnace.

6. In the 60-cycle furnace the maximum oxygen content of the melt comes close to the saturation limit.

7. Melting under an oxygen-free atmosphere prevents oxidation in both types of furnaces.

*Research Metallurgist, Research Laboratory, International Nickel Co.
†Technical Assistant to Vice-President, S. S. White Dental Manufacturing Co.
‡Metallurgist, Research Laboratory, International Nickel Co.

*Group Engineer, General Metallurgical Group, Westinghouse Research Laboratories.
†Driver-Harris Company.

AN X-RAY STUDY OF THE NATURE OF SOLID SOLUTIONS

By Robert T. Phelps and Wheeler P. Davey, Graduate Assistant and Professor of Physical Chemistry, State College, Pa.

1. The solid solution of pure aluminum in pure silver lowers the lattice parameter of the silver by an amount which is proportional to the aluminum content of the solution. Saturation of aluminum in silver is reached at 5.4 per cent Al by weight. Further addition of aluminum gives aggregates of Ag_3Al of sufficient size to show X-ray diffraction patterns.

2. The experimental values for the densities of the solid solutions of aluminum in silver are somewhat lower than those calculated on the basis of a direct substitution of aluminum atoms for silver in the silver lattice. This discrepancy is greater than the combined error in the two values.

3. Systematic examination of the various possible types of explanation for this discrepancy leaves us with only one tenable theory—that the aluminum in the solid solution is chemically combined with the adjacent silver. If this explanation is used as the basis for a general theory of the nature of solutions, the picture is found to be consistent with the known facts. So far, it has not been found inconsistent with any known fact.

EFFECT OF TEMPERATURE UPON THE CHARPY IMPACT STRENGTH OF DIE-CASTING ALLOYS

By Bert E. Sandell, Assistant Metallurgist, Stewart Die-Casting Corporation, Chicago, Ill.

1. The impact strength of this die-cast zinc-base alloy varies with temperature. The alloy is brittle at low temperatures and toughens as the temperature rises, reaching a maximum somewhere below the critical temperature of decomposition of the beta phase.

2. Two die-cast aluminum-silicon alloys exhibit no appreciable variation in impact strength from 0° to 500° F.

It is realized that the data submitted here are the results of an investigation quite preliminary in nature. More work remains to be done not only with these alloys but with others that are in greater use today.

STUDIES UPON THE WIDMANSTÄTTEN STRUCTURE III.—THE ALUMINUM-RICH ALLOYS OF ALUMINUM WITH COPPER, AND OF ALUMINUM WITH MAGNESIUM AND SILICON*

By Robert F. Mehl,† Middletown, Ohio, Charles S. Barrett,‡ Washington, D. C., and Frederick N. Rhines,§ Toledo, Ohio

1. The Widmanstätten figures formed by precipitation from the aluminum-rich solid solutions in the systems aluminum-copper and aluminum-magnesium-silicon have been studied.

2. The precipitate of $CuAl_2$ from the aluminum-rich solid solution in the aluminum-copper system takes the form of plates parallel to the (100) plane in the solid solution lattice throughout the solid solution range, and at concentrations greater than about 1.5 per cent Cu also in a form, probably plate-like, bearing a more complicated (and undetermined) crystallographic relationship to the solid solution lattice.

3. The relationship in orientation between the lattice of the $CuAl_2$ and that of the lattice of the solid solution matrix could not be determined; however, reasons are advanced to show that the (001) plane in $CuAl_2$ should be parallel to the (100) plane in the solid solution, and the [110] direction in $CuAl_2$ parallel to the [120] direction in the solid solution.

4. The precipitate from the aluminum-rich solid solution in the system aluminum-magnesium-silicon takes the form of plates, chiefly lying parallel to the (100) plane in the solid solution lattice, but also (at higher concentrations) of solute upon the (110) plane.

5. Attempts to demonstrate the chemical identity of this precipitate as that of Mg_2Si failed; etching tests and X-ray diffraction qualitative analyses (and other tests) gave indications of the presence of Al_3Mg_2, but offered no support to the assumption of the presence of Mg_2Si or silicon.

6. The significance of these results to a general theory of the formation of Widmanstätten figures is pointed out; possible relationships to age-hardening theories are discussed.

* Published with the permission of the Navy Department, Washington, D. C.

† Formerly Superintendent, Division of Physical Metallurgy, Naval Research Laboratory; now Assistant Director, Research Laboratories, The American Rolling Mill Co.

‡ Assistant Physicist, Division of Physical Metallurgy, Naval Research Laboratory.

§ Naval Research Laboratory and Yale University.

MACHINABILITY OF FREE-CUTTING BRASS ROD

By Alan Morris, Research Engineer, Bridgeport Brass Company, Bridgeport, Conn.

1. A rapid and inexpensive machinability test is described.

2. Machinability of muntz metal improves rapidly with small additions of lead, but much less rapidly as the lead content increases. Within the range of 60.0 to 63.5 per cent, the effect of copper content is small.

3. Machinability of annealed leaded brass rod is harmfully affected by the presence of beta.

4. Machinability is improved by cold drawing after annealing.

5. Tensile properties cannot be expected to indicate machining quality of a rod.

THE SOLUBILITY OF GASES IN METALS*

By V. H. Gottschalk and R. S. Dean, Senior Physicist, and Chief Engineer, Metallurgical Division, U. S. Bureau of Mines, Washington, D. C.

1. An approximate computation has been given to show that the simple solubility of gases in molten metals is, for all practical purposes, zero.

2. It has been suggested that an electronic explanation for the various degrees of tenacity with which gases are held by metals is demanded by Sieverts' periodic table for the interaction of hydrogen with the elements.

3. Attention has been drawn to the desirability of considering thermionic effects in any study involving hot metals.

4. A simple explanation has been offered for the apparent paradox that the reaction in such systems as cuprous oxide-cuprous sulfide in molten copper do not react explosively.

5. The necessity of a knowledge of the intimate structure of gas-metal systems before the mass law may be applied to them is emphasized.

* Published by permission of the Director, U. S. Bureau of Mines.

EQUILIBRIUM RELATIONS IN ALUMINUM-ZINC ALLOYS OF HIGH PURITY

By William L. Fink and Kent R. Van Horn, Metallurgical Division, Aluminum Research Laboratories, New Kensington, Pa., and Cleveland, Ohio

Duplicate determinations by the X-ray method at different temperatures and for various aging periods gave identical results, indicating that even at room temperature equilibrium is rapidly attained in specimens powdered from cold-rolled sheet, and that the method is capable of giving reproducible results. However, it is assumed that the severe cold working has not displaced the equilibrium, but has merely accelerated the precipitation. Moreover, the accuracy of the correction may be influenced by the relative size of the zinc particles in the standards and the *a* solution in the solubility samples.

The solubility limits so determined are presented in Table 2, and compared in Fig. 6 with the results that have been obtained by the various investigators. The the isolated results from the experimental hardness and curve determined in the present investigation by the X-ray method is in good agreement from 25° to 150° C.

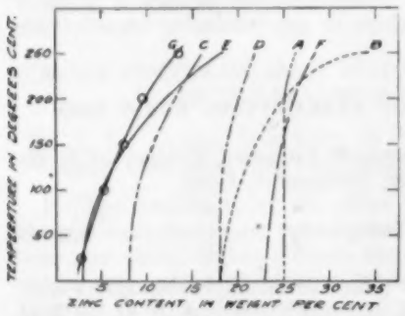


Fig. 6—Solid solubility of zinc in aluminum according to previous investigators.

A. Bauer and Vogel
B. Hanson and Gayler
C. Tiedemann: Sander and Meissner
D. Tanabe
E. Nishimura
F. Ishihara
G. Fink and Van Horn, present investigation.

with that of H. Nishimura. It should also be noted that electrical conductivity determinations approximate the corresponding values of Table 2.

TABLE 2.—SOLUBILITY OF ZINC IN ALUMINUM

Temperature, Deg. C.	Zinc Content, Per Cent
25	2.7
100	5.2
150	7.4
200	9.4
250	13.4

A REVIEW OF WORK ON GASES IN COPPER

By O. W. Ellis, Ontario Research Foundation, Toronto, Ontario, Canada

It is abundantly clear that much has yet to be done ere the problem of the composition of the gases dissolved in copper is completely solved. The widely opposed views regarding the solubility, for example, of carbon monoxide in copper (Slavinski, Gorshkow and Syromiatnikow, for instance, say quite definitely, "It has been proved experimentally that CO is insoluble in copper."), the divergence of opinion as to the behavior of nitrogen and the differences in belief regarding the role of sulfur make it quite evident that further facts are required. Those who have concerned themselves with the phenomenon of overpoling and have shown beyond a peradventure the important role played by hydrogen in this connection have, in the author's opinion, been tempted to view as heresy all statements to the effect that gases other than hydrogen can have any effect on the porosity of copper. Too many experiments, however, have been conducted, in which other gases than water vapor have been found in the mixtures evolved or extracted from copper, for these to be lightly set aside. The fire-refining of copper is an important process, but hundreds of tons of castings are being made in such furnaces and under such conditions as have been rather roughly described in the author's paper on Absorbability of Gases in Casting Copper. These conditions differ materially from those existing in fire-refining practice, and while the author freely admits that the presence of hydrogen in copper is the most likely cause of the troubles met with in the casting of copper under more or less ordinary foundry conditions, he does not feel that sufficient evidence has even yet been produced to enable one to say that such gases as carbon monoxide, nitrogen and sulfur dioxide are quite innocuous.

THE DEGASSING OF METALS

By F. J. Norton and A. L. Marshall, General Electric Company, Schenectady, N. Y.

The object of this investigation was to make a comprehensive study of the degassing of molybdenum in order to determine how rigorous a treatment was necessary to completely remove sorbed gases from molybdenum electrodes in vacuum tubes. Some work has also been done with tungsten, nickel and carbon. As a logical development of this work it has been shown that the gas is present throughout the body of the metal and a study has been made of the solubility of nitrogen in molybdenum and tungsten and the rate of diffusion of nitrogen through molybdenum has been calculated.

Tests were made on molybdenum from all the commercial sources and no difference was discovered in the nature of the gases present, the amounts or the ease of removal. The reason for this was apparent when a study was made of the manner in which gases are absorbed by gas-free molybdenum. It is necessary to heat molybdenum to 1,760° C. in a vacuum of the order of 0.001 micron for a time which varies lineally with the thickness, in order to obtain a condition in which no further gas is evolved by the sample. A sample so degassed can be handled and subsequently assembled in a tube and then degassed readily. The gases obtained from molybdenum are carbon monoxide and nitrogen, the nitrogen being the more difficult to remove.

INFLUENCE OF GASES ON METALS AND INFLUENCE OF MELTING IN VACUO

By Wilhelm Rohn, Director, Heraeus Vacuumschmelze, A.G., Hanau, Germany

The author discusses the influence of gas content on metals and alloys, first considering the physical and chemical conditions in which these gases may be present. He cites also the causes of gases. Melting in vacuo is discussed and the advantages given of vacuum melting, which have been confirmed by the impact test. There are numerous practical applications of vacuum melting.

THEORETICAL METALLURGY

One session of the meetings was devoted to Theoretical Metallurgy, in which the following papers were read and discussed:

On the Theory of Formation of Segregate Structures in Alloys. By C. M. Mathewson and D. W. Smith, professor of metallurgy, and graduate student, Yale University, New Haven, Conn.

Structure of Cold-Drawn Tubing. By John T. Norton and R. E. Hiller.

The Influence of the Mosaic Structure of Crystalline Metals on Their Physical Properties. A lecture by Dr. A. Goetz, California Institute of Technology.

Federal Metal Specifications

Proposed Federal Specification for Non-Ferrous Metal Composition Used in Plumbing Fixtures for Shore Purposes†

D-4b. **Compositions.** Red metal and white metal not required to be plated shall each be uniform in color for cast and drawn materials.

D-4b (1). **Brass** shall contain not less than 65 per cent copper and not more than 5 per cent lead.

D-4b (2). **Red Metal** shall be of the following compositions, by weight, according to whether the material is cast or drawn:

ELEMENTS	CAST (per cent)	DRAWN (per cent)
Copper	85 (min.)	83 to 86
Lead	4 (max.)	0.06 (max.)
Tin	5 (min.)	..
Iron	..	0.05 (max.)
Zinc	7 (max.)	14 to 17

D-4b (3). **White metal** (nickel silver or nickel bronze) shall be of the following compositions, by weight, according to whether the material is cast or drawn:

ELEMENTS	CAST (per cent)	DRAWN (per cent)	LEADED** (per cent)
Copper	62 (min.) (65)*	73 to 81 (75)*	62 (min.) (65)*
Nickel	19 (min.) (20)*	19 (min.) (20)*	17 (min.) (18)*
Tin	2.5 (min.) (4)*		
Lead	6 (max.) (5)*		1.5 (max.)
Zinc	10 (max.) (6)*	6 (max.) (5)*	18 (max.) (17)*
Manganese	1 (max.)		0.5 (max.)
Iron and other impurities	1 (max.)	2 (max.)	

* Figures within parentheses denote the desired composition.
** For all machine made parts such as cap nuts, screws, bolts, etc.

D-4b (4). **Chromium-nickel-steel alloy** shall be of the following composition, by weight:

	(Per Cent)
Chromium	16 to 20
Nickel	7 to 10
Manganese	0.50 (max.)
Copper	5.00 (max.)
Carbon	0.20 (max.)
Phosphorous	0.30 (max.)
Sulphur	0.30 (max.)
Silicon	0.75 (max.)
Iron	63 to 77

D-4b (5). **Copper-nickel alloy** shall be of the following composition by weight:

	(Per Cent)
Copper	23 (min.)
Nickel	60 (min.)
Iron	3.50 (max.)
Manganese	3.50 (max.)
Aluminum	0.50 (max.)
Silicon	0.50 (max.)
Carbon	0.30 (max.)

† Abstracted from Proposed Federal Specification WW-P-451 (Revision of No. 448); obtainable in full from the Federal Specifications Board, Washington, D. C.

The Chromium Plating Situation

IN keeping with its policy of seeking authoritative information for its readers, the METAL INDUSTRY has recently interviewed Weisberg & Greenwald, chemical engineers, 71 West 45th Street, New York, on the subject of chromium plating and the existing patent situation, and herewith presents the substance of that interview.

As most of our readers already know from previous issues of the METAL INDUSTRY, an action was brought by United Chromium, Inc., against International Silver Company for alleged infringement of the Fink patent, No. 1,581,188, relating to chromium plating, and a decision was handed down last October by Judge Thomas, sustaining all claims of the Fink patent and holding it infringed.

Weisberg & Greenwald stated that the decision of Judge Thomas has been appealed to the Circuit Court in New York, and that every effort is being made to have the appeal heard before the court adjourns for the summer recess. They believe that this can be done.

Asked if there were any new developments in chromium plating, Weisberg & Greenwald revealed that they had been working for some time on a new process, and that they had been successful in developing a process which is, in their opinion, a considerable improvement on present methods. This process has been in large scale operation in one of the larger chromium plating plants in the East for a number of months, with gratifying results. In addition to the fact that this new process is outside the existing patents, they went on to say, it has a number of advantages of its own, from the purely operating standpoint. The new solution can be operated indefinitely without additions of any kind other than the chromium-containing compound. It is simpler to operate than any solution heretofore available and makes it easier to obtain good results than it has been up to this time, they state, and no changes in present chromium plating equipment are necessary.

Foundry Sand Control

By A. A. GRUBB
Consulting Metallurgist

The Organization and Carrying On of a Program of Sand Control Are Described Clearly and Concisely—Conclusion*

FROM THE BULLETIN OF THE AMERICAN FOUNDRYMEN'S ASSOCIATION, NOVEMBER, 1931

Frequency of Tests

HOW often are the tests made? This question requires a different answer for every foundry. A Wisconsin survey revealed that one plant made permeability and strength tests approximately every hour, while another made them once a month.

Where a conveyor and mechanical conditioning system are used, frequent tests can easily be made every hour or oftener if necessary in order to keep the sand in uniform condition. Where there are a large number of sand heaps, such frequent tests are obviously impractical. Permeability and green strength tests once a day, and dry strength, clay and fineness once a month, usually are sufficient. Where the castings are light and not hard on the sand, tests can be made less frequently, even but once each week.

After all, the answer to the question, "How often?" is just this: Make sufficient tests to keep in touch with the condition of the sand, no more and no less. When casting losses are low—when the sand is in especially good condition—make complete tests, get full information on it and keep this data as a guide for future control.

New Sands and Clays

If sand and clay additions to the heaps are to be made intelligently, it is necessary that the supplies of new material be under careful control. Not only must the foundryman know the properties of his new sands and the effects they will have on the heaps on his foundry floor, but he should also be able to duplicate shipments within reasonable limits. Sand control commences at the producer's pit.

The percentage of sand producers who carefully determine and control the properties of their sands by scientific methods is low, probably not over fifty per cent. They are, however, the larger producers and account for at least 85 per cent of the sand tonnage. There are still many small producers who roughly judge by hand and by eye the uniformity of the sand they mine and load it directly into cars or trucks without milling or other treatment. They are decreasing in number each year, however, as the demand for uniformly controlled sand on the part of foundrymen is being asserted.

Effectiveness of Producer Control

The effectiveness of control on the part of the other producers varies widely. Some of them make or have made for them careful measurements of clay substance and grain fineness on every car of sand they ship.

One of the largest producers in the central states maintains a central laboratory which serves the several sand workings which he operates. Samples are taken from the face of the working and from each car that is loaded. They are promptly delivered to the laboratory, where determinations of clay and grain fineness are made and reported back, frequently before the car is released to the railroad for shipment. Permeability and bond strength tests, too, are frequently made. This producer claims that he can control the clay of his shipments within two per cent, and the fineness within 5 to 10 units.

Another large producer has installed elaborate blending and milling equipment at each of his workings. Any desired clay content and fineness within the range of his materials are obtained by mixing these materials that are taken from various places in his pits and then milling them together in proper proportions and, finally, screening the resulting mixture. A specially constructed device for quickly measuring the clay content of the sand enables the operator to make several tests while loading a car and change proportions of raw materials to give the desired sand.

Frequent samples are sent to a nearby commercial laboratory to be accurately tested for clay and fineness, and also for permeability and bond strength when these tests are required by his customers. He is able to produce a uniform product that is controlled fairly accurately to specifications. This poducer also keeps informed on the refractory qualities of his sands and is able to supply such data to his customers.

Tests Most Widely Used

Clay and fineness are the most widely used tests for controlling and purchasing new sand supplies. The A. F. A. grading system, based on these properties, affords a uniform series of grades that enables foundrymen, purchasing agents and producers to talk sands in common terms.

Chemical analysis is used as an index to refractory qualities, although to a less extent than in former years. Refractory properties are more often measured directly by fusion point or the sintering test which was developed by the U. S. Bureau of Standards for this purpose.

Clay quality is of importance because of its effect on bond strength, especially dry strength. Sands of fairly lean clay content as typified by the well-known Albany, N. Y., sands, finds wide and very successful use for brass

* Part 1 was published in our February issue. This paper by the late A. A. Grubb, whose untimely death on September 29, 1931, was a source of deep loss to the foundry industry, was prepared by him as the 1931 A. F. A. exchange paper to the Dutch Foundry Association, for their annual meeting. Mr. Grubb was known for years as one of the leaders in research work on foundry sands, and his many papers and reports aided the industry greatly in its foundry sand problems.

castings, while sands of sticky clay content are better adapted to large castings and dry sand molding. They are high in dry strength. Bentonites and sticky clays are widely used for making synthetic sands and steel facings.

Control of Properties

The determination of the sand properties that are most suitable for the work at hand, the tests on the heaps for information on their condition from time to time, and the supply of new sands and other materials for maintaining the sand in condition, are but steps leading to the actual control of the sand. The manner of using this information and the materials that are provided differs widely in various foundries.

In some foundries the test data is given to the men who cut the sand, and the sand additions are left entirely to their discretion. They are held responsible, in part at least, for the casting losses; results depend largely on the individual's ability to use the data intelligently. In a foundry where the molders cut their own sand, results from such a system vary widely, the more intelligent molders making most use of it. Frequent and careful supervision by a foreman or a technical man helps matters considerably.

It has been the writer's observation that results from sand control are best in those foundries where the supervision is given by a man who has had some technical training as well as some practical experience as a molder. In many foundries all additions of new sand or clay, all facing mixtures, the tempering and cutting of sand are personally handled or directed by such a man. The tests may be made by a boy and the sand may be added and cut in by common labor, but the interpretation of the test data and the decision as to what materials are to be added and in what quantity should be made by a man of experience and training.

Sand technology has not yet been developed to an exact science; sand additions cannot be determined from the test data for every foundry condition with mathematical accuracy. In the hands of an intelligent foundryman, however, the sand control tests are powerful, effective tools.

The Advantages of Control

Careful measurement of sand, clay and cereal bonding materials is highly desirable in making up facing mixtures. Many foundries measure sand by the barrow and bonding materials by the shovel; water is frequently added to the batch in the mixer without measurement, estimating the desired quantity by feel. With high-class labor on the mixing job they apparently get at least fair results.

One of the best controlled foundries that we have observed measures everything accurately. The used sand that is to go into facing mixtures is dried and renovated by air washing. It is measured out to stroke measure in a large steel box that is handled mechanically and dumped into the mixer. Clay, cereals and silica flour are measured in boxes carefully filled to the rim and stroked off. Water is automatically measured in, and a timing device controls the period of mulling. A very uniform facing is produced. This care and accuracy of control is reflected in the quality of their product.

Results

Careful scientific control of foundry sand properties has resulted in lower sand costs, fewer losses and improved casting surfaces. It has enabled foundries to centralize their sand conditioning under the direction of one man and then to man their molding machines with operators who are not necessarily experienced molders.

Sand control methods have been largely responsible for the great increase in the use of synthetic sands. Instead of buying new sand of the desired molding characteristics and discarding it as it becomes too badly burned, many foundries are building sands to their special needs.

They start with a low clay sand or even clean silica and add clay, silica flour, cereal binders, sea coal, etc., in measured quantities to get the molding properties that are needed. Burned sand is recovered and renovated, then rebonded and used over again many times. All this is possible only when the properties of the new materials as well as the rebonded sand can be accurately controlled.

In a recent report of the A. F. A. Committee on Sand Conservation and Reclamation, R. F. Harrington quotes letters from several foundries to the effect that they have made marked savings in sand cost and improved the quality and appearance of their castings. This report concluded that the survey pointed out "the importance of sand testing and control as an adjunct to a successful conservation program.

In conclusion, the writer would add this thought. The benefits of scientific sand control come in part from better sands, better molding properties and better molds. They are the result, too, of certain psychological effects on the molders and other workmen. When sand varies widely in properties from day to day, when these changes and the resulting casting losses cannot be understood, workmen become careless of their technique. The sand is a possible alibi for careless or dirty molding.

Careful control of sand properties as well as of metal properties and molding equipment reduces the number of variables, permits responsibility for losses to be correctly placed and develops in the operators habits of care and accuracy.

Acid-Resisting Metals

Q.—Please advise us what metal, if any, would resist the chemical action of writing fluids which might contain the following acids:

Tannic acid; gallic acid; ferrous salts; dilute mineral acids such as hydrochloric in a concentration of not over 1% or 2%.

A.—It is difficult to predict how any particular metal or alloy will behave if exposed to a mixture of more or less corrosive substances. Some sort of a test is almost always necessary before one can use with confidence any material under such conditions. The combination of substances which you mention is such that perfect resistance by any metal is rather more than can be expected. However, it should be possible to find one which will resist it well enough for practical purposes.

We would suggest that you try KA2 steel, KA4 steel, and Monel. KA2 steel is sold under various trade names, such as "Alleghany Metal," "Rezistal," and "Nirosta." Whatever its name, this steel contains approximately 18% chromium with 8% nickel, and is remarkably resistant to most corrosive substances, including some of those which you have mentioned. KA4 steel contains about 19% chromium, 10% nickel, with 3.25% molybdenum. It is considerably more expensive, but also more resistant to corrosion in most cases. Monel, of course, s a common alloy which might possibly serve you well enough. Our suggestion would be that you obtain samples of these materials and try them out before committing yourselves to the use of any one of them.

H. M. St. John

Large Scale Brass Annealing In Gas-Fired Muffles

By W. WIRT YOUNG, Jr.
Connecticut Light and Power Company, Waterbury, Conn.

This Process is Now an Accomplished Fact in the Chase Rolling Mills Plant in Waterbury, Conn. The Capacity is Between 5,000 and 6,000 lbs. of Brass per Hour.

FROM "INDUSTRIAL GAS," FEBRUARY, 1932

RESULTS over a period of more than two years on the first continuous large brass coil annealing furnace fired with manufactured gas have been gratifying. This furnace was built by the Surface Combustion Company in 1929 and initially installed as an experimental unit in the Chase Rolling Mills plant of the Chase Company, Inc., in Waterbury, Conn. It is now operating 24 hours per day, four to five days a week as a production unit on finish annealing.

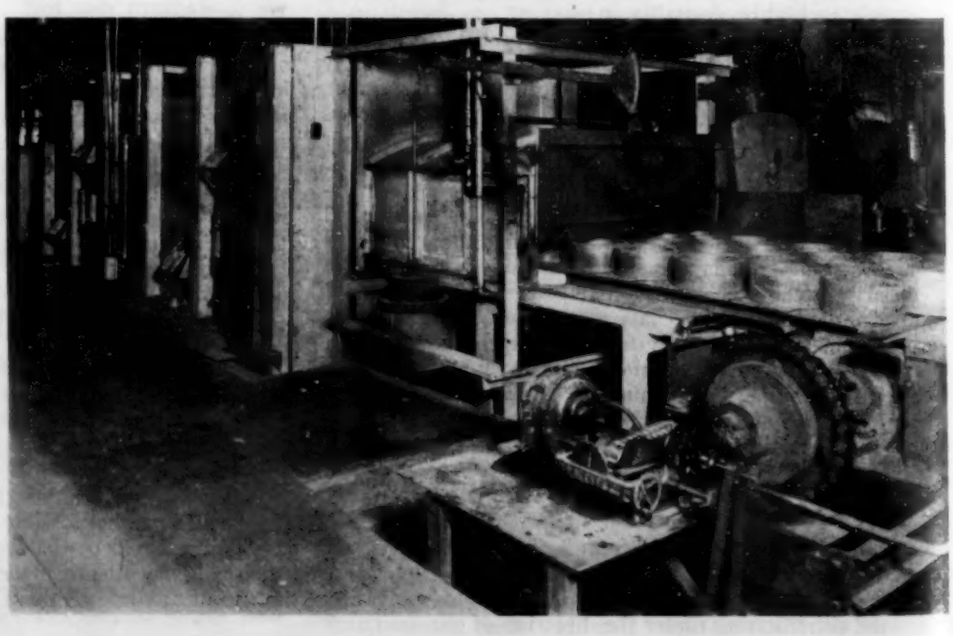
Over-all dimensions of the furnace are 30 ft. long by 8 ft. wide by 7 ft. high. The conveyor extends 10 ft. beyond the furnace on the charging end and 15 ft. on the discharging end. The heating chamber proper is 30 ft. long, 5 ft. wide and 20 in. high. In addition there is a 6-ft. hood on the inlet end of the furnace and a 9-ft. hood on the outlet end. A small amount of preheating is attained in the hood on the feeding end. The heating chamber is divided into three approximately equal zones. Control on the first zone is by hand and it is operated at a temperature head for fast heating. The second is a controlling zone automatically controlled by Leeds and Northrup instruments and Bristol valves. In the third zone the brass is soaked to attain uniformity. The temperature in this final zone is also automatically controlled.

Nine inches of fire brick and 9 in. of Armstrong insulating brick comprise the lining of the heating chamber. The gas-burning system consists of 26 two-stage Surface Combustion high-pressure burners operating with 530 B.t.u. manufactured gas at 10 lb. pressure supplied by the gas company. These 26 burners are staggered with 13 overfiring the charge and 13 underfiring. Each of these burners has a gas capacity of approximately 300 cu. ft. per hour, making the total gas capacity of the furnace about 7,800 cu. ft. per hour.

Originally the conveyor system was of the chain and apron type. After experimentation this was later modified to a pan puller conveyor. This latter system has proved more satisfactory and has eliminated some labor and handling hot metal.

Diverse speeds are obtained by a Reeves variable drive operating the conveyor chain. This drive has a four-to-one ratio. The speeds used vary from 3 in. per minute to 12 in. per minute and consequently the time of the charge in the heating chamber varies from a half hour to two hours. This time in the heating chamber is, of course, dependent upon the weight and dimensions of the charge and the temperature of the anneal.

The usual charge in the furnace consists of 30 coils,

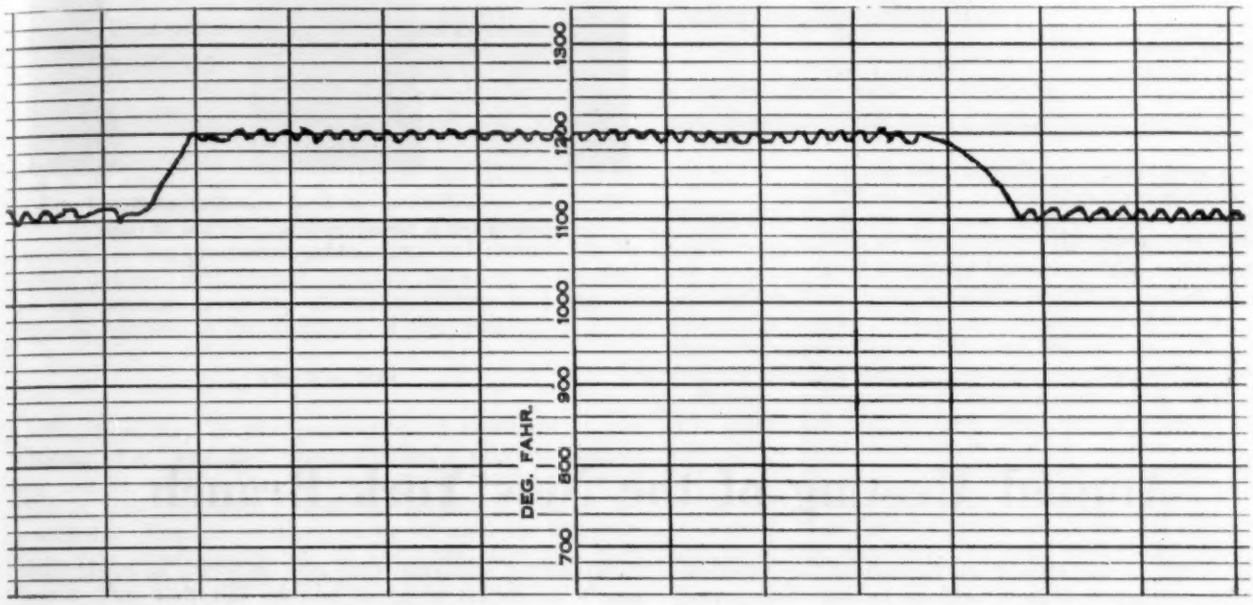


Continuous gas-fired annealing furnace at Chase Company, Inc., Waterbury, Conn., showing outlet end. Controls are at rear left and Reeves drive at front right.

each weighing 100 lb. per coil. This is the customary weight per coil as it is the maximum poundage which a man can handle efficiently. These coils will vary in outside diameter from 14 to 18 in. and in width from four to 18 in. The gage runs from five to forty thousandths of an inch, the average gage being approximately twenty-five thousandths. Loading pans used are 11 ft. long and 4½ ft. wide.

After a week-end shutdown the temperature of the furnace is 500 deg. F. to 600 deg. F. It is brought up to annealing temperature of 1,100 deg. F. to 1,200 deg. F. in two hours. A breaking down charge is then run through for two to three hours to allow the furnace to become thoroughly soaked. After this the furnace is in the proper condition for finish annealing.

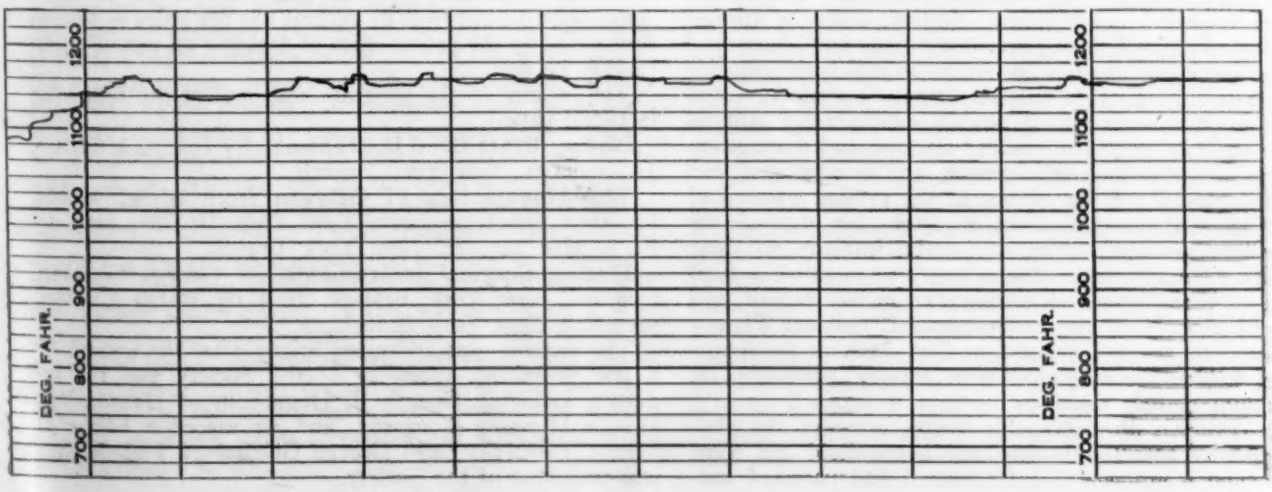
Actual operating figures on the furnace are given as follows: Its production capacity is 5,000 to 6,000 lb. of net brass per hour. Temperatures used vary from 1,100 deg. F. to 1,250 deg. F., depending on the degree of anneal and type of charge. Actual tests on 24-hour operation, 125-hour week, with an average temperature of 1,150 deg. F. and average composition of charge about 65 per cent copper and 35 per cent zinc show a gas consumption of sixty-six hundredths of a cubic foot per pound of net brass. Eleven-hour operation, 60-hour week, with the same temperature and composition averages netted a gas consumption of eighty-five hundredths of a cubic foot per pound. These consumptions include the gas used for heating up and for pilot over shutdown. The over-all efficiency on a 24-hour basis worked out from the above figures is about 29 per cent.



Temperature control chart showing temperature in soaking zone of furnace. Note changes of 100 deg. F. in temperature in 15 minutes or less.

For purposes of comparison with wood-fired muffles used for the finish annealing of brass it might be stated that the production in wood furnaces runs 25,000 to 30,000 net pounds of brass per cord of wood. Fifty cents per cord is the cost of handling and loading the wood, including ash removal.

The burners on the gas furnace are actually reducing and if the doors are closed an atmosphere of 1 to 2 per cent carbon monoxide can be maintained. However, with the furnace running continuously with the doors open the atmosphere averages 6 to 8 per cent oxygen. When



Temperature control in controlling zone.

the burners are on full with the furnace running, the oxygen content is only 2 to 3 per cent.

A very uniform anneal is obtained, the maximum variation in grain size being less than on other furnaces used for this type of work. The surface of the metal is slightly oxidized but pickles very readily to give an excellent finish.

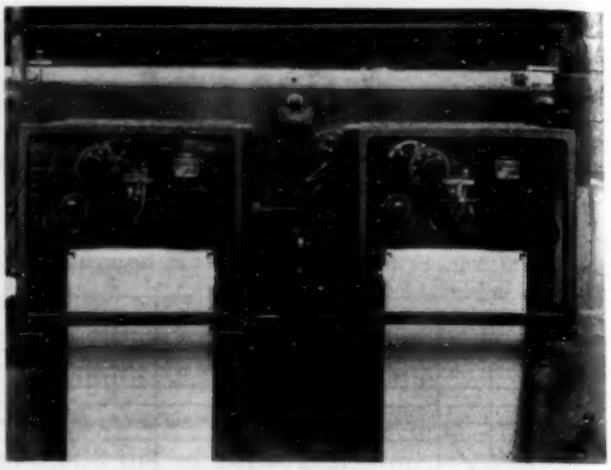
OPERATING DATA ON LARGE BRASS ANNEALING FURNACE FIRED WITH 530 B.T.U. GAS

Burner capacity	7800 cu. ft. per hr.
Production capacity	6000 lbs. net brass per hr.
Gas consumption	
24-hour operation	.66 cu. ft. per lb.
125-hour week	
11-hour operation	.85 cu. ft. per lb.
60-hour week	

Above figures include heating up and pilot consumption over shut down.

Average temperature	1150 deg. F.
Average composition of brass	65% cu. 35% zn.
Temperature limits	1100 deg. F. to 1250 deg. F.
Limits of brass composition	60-40 to 90-10.

Finish-excellent, slightly oxidized but pickles readily.



Recording controllers on gas-fired annealing muffle. Instrument at left is for controlling zone; one at right, for soaking zone.

Annual Meeting of the New York Branch

LAST month the New York Branch of the American Electroplaters' Society held its twenty-third annual meeting, consisting of an afternoon educational session and a banquet in the evening, all held at the Aldine Club, New York. The occasion was up to the usual high standard of this Branch, and a good attendance was drawn to both the session and the dinner.

The educational session was marked by a number of very good technical papers, preceded by a special paper by Charles H. Proctor, who was chairman of the session. Mr. Proctor's paper dealt with "The Future of Chromium Plating in America," and it made a number of points of great interest to the industry.

The patent office and its methods of granting exclusive rights to technical processes was its chief topic, Mr. Proctor contending that the Government's patent procedure is not entirely what it should be. This results, he pointed out, in the granting of patents without careful and competent scientific and technical scrutiny, with the further consequence that industry frequently finds itself hampered by demands for royalties on patents to which the patentee has no actual right. It was Mr. Proctor's contention that the Fink chromium plating patents were granted without due consideration of the work of Sargent and other scientists prior to the Fink development, and he advocated that the industry resist the efforts of the present owners of the Fink patents to collect royalties for use of the chromium solutions which they claim infringe on those patents. He also urged the industry to establish a fund to pay for any litigation encountered in this regard, and advised support of the Independent Chromium Platers' Association, recently formed at Los Angeles to oppose patent holders seeking to force royalty payments on chromium plating solutions.

Mr. Proctor, developing his theme, reviewed the plating process patent situation that has existed for some years, and mentioned that he himself had patented cadmium plating solutions years ago, on which he might have sought to collect royalties had he felt that such action would be fair to the industry.

Mr. Proctor then drew attention to the fact that the patent office continues daily to grant patents on electrodeposited coatings in combinations which in effect constitute patents on chromim plated finishes. Such coatings, he said, are generally patented as methods of protecting steel, and consist of several deposits over one another, such as copper, nickel and cadmium; copper, cadmium and cobalt; copper and cadmium, or vice versa; all of which are always specified as deposits preceding a final deposit of chromium, which is generally stated to be the outer coating. He declared that calling these patented combinations steel protection methods did not alter the fact that since chromium was always the outer layer, they were in effect restrictions on the free use of chromium deposits. The fact that some of the patented combinations have been in general use for years is seldom considered by the patent office in deciding on patent applications, he said.

The balance of the program consisted of the following technical papers:

Plating Brass Band Instruments, by Joseph Musante, Jr., member, New York Branch.

The Manufacture of Galvano from Metal Molds, by Elias Schor, member, New York Branch; read by F. J. Mac Stocker, New York Branch.

Plating Surgical Instruments, by George Gorman, member, New York Branch; read by Ralph Liguori, president, New York Branch.

The meeting was addressed briefly after the session by a few prominent members of the Society and the industry, including George B. Hogaboom of Hanson-Van Winkle-Munning Company, and an associate editor of METAL INDUSTRY; and George Gehling of Philadelphia, past-president of the Society.

The Manufacture of Phonograph Records

By R. A. DIMON

A Complete Description of the Steps Followed in This Accurate Type of Plating on Non-Metallics.

FROM THE MONTHLY REVIEW OF THE AMERICAN ELECTROPLATERS' SOCIETY, JANUARY, 1932

THE electrodeposition of metals has always played a very important rôle in the manufacture of phonograph records. In this paper the entire process involved in the production of a completed record will be briefly outlined with special emphasis placed upon the part of the process involving electrodeposition as being of especial interest to the members of this Society.

The Wax Disc

The first step in the production of a record is the making of a "wax disc" upon which the original recording can be made. This disc is actually more of a soap than a wax although it contains certain waxes as ingredients. The compositions of waxes used for this purpose vary considerably but all are quite hard and have a relatively high melting point. Their physical properties must be such as to adapt them to recording. The wax is first cast in a disc somewhat larger in diameter than the finished record and about 1½" thick. It is then "roughed out" or machined to the required dimensions and is finally placed on a rapidly rotating turntable and "shaved." This shaving consists of taking two cuts across the surface of the wax, first a rough cut and then a finish cut with two different tools mounted together on a carriage which is automatically fed across the surface of the wax. After the finish cut the wax disc has a very perfect surface which resembles a mirror.

In order to make a recording a shaved wax disc is placed upon the turntable of a recording machine which is constructed to give very true and uniform rotation and an electrical recorder is mounted above the wax on a carriage in such a way as to cause it to feed across the surface of the wax uniformly during the recording. In the case of ordinary commercial records the recording is made from the outside of the wax to the center and in the case of talking picture records the recording is from the center to the outside. Microphones such as are used in radio broadcasting are placed before the artist or musical organization which is to make the recording. The sound waves reaching the microphones are transformed by them into electrical impulses which are amplified by an electrical amplifier. These amplified impulses pass through a fine coil on the electrical recorder and cause the sapphire recording stylus to vibrate in accordance with the original sound waves. In this way a winding groove is cut in the wax disc which is an exact reproduction of the sound waves reaching the microphones. This system has completely replaced the old acoustical recording system in which the sound waves were received in a horn and the recording stylus accentuated by a diaphragm and is far superior to it.

Plating on Wax

It is now necessary to make from this recorded wax an exact reproduction in metal which can be used for pressing records out of a plastic material. The usual way to accomplish this is to sprinkle very fine copper bronze powder or copper "lining" on the surface of the wax and then thoroughly brush this over the surface with a very fine camel's hair brush. In this way the surface retains sufficient metal powder to become electrically conductive. The metallized wax is then fitted into a suitable holder and placed in an acid copper plating solution. The copper begins to grow from the metal connection on the holder and proceeds to cover the metallized surface of the wax much in the same manner as in electrotyping where graphited wax moulds are covered with copper or nickel.

When the deposit has completely covered the wax an appropriate current density is applied and the copper is built up usually to a thickness of approximately .020". The rate at which this deposition is carried on is limited and governed by several factors. In the first place it is not possible to run these baths at temperatures very much higher than room temperature because of the danger of softening the wax. In the second place a perfectly smooth deposit must be secured and no chance must be taken of not securing a smooth deposit on this wax recording as only one deposit can be made on each wax and if it must be rejected for any reason the recording is lost and must be repeated.

Duplicating the Master Matrix

When the proper thickness of copper has been secured the wax is removed from the bath and the metal shell which has been deposited on it is stripped away from it. This then is an exact duplicate in negative of the original recording and is known as the master matrix shell. In order to secure pressings from this shell it must be "backed up," which consists in soldering or "sweating" the shell to a copper disc about 1/16" thick.

The surface of the shell is then polished and nickel-plated and the result is known as the master matrix. While this matrix is not used to obtain any considerable quantity of record pressings directly, a few records known as sample pressings are usually made from it. From these sample pressings it can be determined whether there are any defects in the recording and whether or not this particular recording should be placed on the market. Assuming that this decision is favorable, it is now necessary to produce a number of exact duplicates of this original master matrix in order that the master may be filed away for future reference and also to enable a

number of record presses to be placed in operation simultaneously in order to meet the production demands for this particular selection.

In order to do this it is necessary to first make what is known as a master metal mould which cannot itself be used for pressing records inasmuch as it is a positive with respect to the original recording rather than a negative. It can, however, be used for making other matrices which are known as pressing matrices, which can in turn be used on the presses. The procedure for making a master metal mould from the master matrix or for making pressing matrices from the master metal mould is essentially the same. The master matrix or metal mould is thoroughly cleaned and placed in a "separating fluid" which produces what might be called a chemically unclean surface on the metal. In other words, a film is formed which, while being conductive and permitting the deposition of metal, renders it possible to subsequently separate the deposit from the metal on which it was deposited. Electroplaters will be able to understand this by recalling what happens to nickelplate when the surface upon which it was plated is unintentionally not clean causing the nickel to blister or peel.

After treating in this separating fluid the matrix or mould being duplicated is rinsed and placed in a nickel-plating solution where it receives a plate of approximately .0005". It is then rinsed and transferred to a suitable holder and placed in a copper-plating bath where it is built up to the required thickness, which is in the case of matrices which are to be backed up about .020". In the case of metal moulds which are not to be used in the presses but only for making additional matrices and are, therefore, not backed up, this is about .030".

The steps just outlined illustrate the two different types of copper deposition which are carried on in the production of matrices. In the one case deposition upon the wax original and in the other case deposition upon a metal matrix or mould which has been treated with a separating fluid. It is impossible to lay down an exact schedule or "family tree" which would hold for definite selections produced inasmuch as this is governed entirely by the demands on that particular selection and the time element. In some cases only a few matrices may be required, in which case only one mould will have to be made. In other cases where a great many pressing matrices are required to produce a large number of records in a relatively short time, it is necessary to produce a master metal mould from the master matrix and then make what are called working master matrices from that. These working master matrices are then used for making what are termed nickel metal moulds, which are in turn used for making pressing matrices. It will be seen that an infinite variety of schedules can be worked out utilizing the two methods of deposition already referred to. For this reason no effort will be made to trace further any particular schedule, but a few details will be given in regard to the methods used in the deposition.

Requirements of the Deposit

In general the principles of copper plating that have been developed at the Bureau of Standards and the rapid copper plating solutions which were worked out there by R. O. Hull, who is now on our staff, have proved applicable to the rapid deposition in matrix production.

Our requirements differ, however, from those of the electrotyper, inasmuch as we produce a shell 4 or 5 times as thick and this shell must be smooth on the back and very nearly of uniform thickness throughout. Uniformity of thickness with respect to the center of the matrix is obtained by rotating the matrix with its center as an axis while it is in the bath. This rotation acts at the same time as a sort of mechanical agitation and tends towards the production of smooth deposits. Uniformity from the center to the outside is not as easily obtained but is approximated by the designing of the plating holders in such a way as to have a hard rubber rim projecting beyond the face of the matrix being deposited. This prevents excessive current density at the edge of the matrix and by the proper design of this holder shells varying in thickness from the extreme center to the outside edge less than 10 per cent of their total thickness can be produced.

The time used to deposit a master matrix shell or a metal mould or pressing matrix shell depends somewhat on the demand for the particular selection involved. It has been found possible to do a large percentage of our deposition slowly at night. In this way work which is received during the day is mounted and placed in the baths in the afternoon and deposited during the night and removed from the baths during the following morning. Not a great deal of time is lost in this way provided that we are working on an 8-hour-day schedule, inasmuch as work received during the day can be ready early the next day. However, it has been found possible to greatly increase the rate of deposition over that used for all-night runs and this is used in cases of extreme demand. The rate used in all-night deposition is approximately .001" deposit per hour or a current density of 20 amps. per square foot. This can be increased to .010" per hour, or a current density of 200 amps. per square foot, by the use of solutions high in metal and acid and containing addition agents. The solutions are run at about 40° C. and the agitation is increased by speeding up the rotation of the work.

The finishing of matrices is largely a matter of machining them to the proper dimensions to fit into the presses. Shells which have come from the bath slightly rough are hand-ground on the backs to render them smooth enough to be sweated to 1/16" thick copper backs. A certain amount of polishing of the nickel faces is done by mounting the matrices on a high-speed spindle and applying liquid polishing solutions with a cloth or brush. In some cases it is possible to remove by hand slight defects which may have crept into the process, using very fine tools. This repairing as it is called is quite a fine art and must be much more accurately and finely done than is the case with repairing and finishing of electrotypes, as the slightest roughness or imperfections in a groove will result in a click being heard in the finished record which would cause its rejection.

Making the Records

After being machined to the proper diameter the pressing matrices are mounted in the record presses in which they are held by a large circular ring which grips them around the outside diameter. The presses themselves consist of two platens which are drilled through to permit the circulation of steam or cold water and arranged in such a way that they can be quickly opened in book fashion so that they can be brought together quickly and a pressure of approximately 2000 lbs. per square inch applied between them. In making a pressing the operator faces the record press with a steam-heated iron table at his right. Flat rectangular sheets of the record material are placed on the steamtable and softened there by the heat. The operator removes one of these softened sheets with a broad steel knife, folds it twice and places it on the lower matrix of the press. The upper matrix is mounted on a platen which is hinged at the back of

the press and this platen is lowered, bringing the two matrices together in a parallel position. The locking device is then closed and the pressure of 2000 lbs. per square inch applied by hydraulic pressure operating under a piston or ram which exerts an upward pressure on the lower matrix. At the time the operator closes the press only high-pressure steam is opened to the coils in the press platens. Almost immediately after the press has been closed and the pressure brought up the steam is automatically shut off and cold water circulated through the coils. The pressure applied to the record material which has been softened by the heat flows it into the grooves of the two matrices and forms a duplicate of these two surfaces. The cooling of the platens by the cold water cools the record material, causing it to harden. When sufficiently hard the press is opened and the record removed. The action of these presses can perhaps best be visualized by picturing a round waffle iron in which the two grids are the two matrices and the batter the record material. The complete cycle required for each record is approximately 30 seconds. During the time that the record is cooling in the press the operator places another sheet of record material on the steamtable to replace the one which he has just removed. In this way he always has soft material on the steamtable ready to be pressed.

The labels are applied during pressing and are simply laid on the top and bottom matrix over center pins before the record material is placed in the press.

The records are then edged or smoothed on the edge by placing them between two rapidly rotating clamps and applying emery paper at the edge. The records are then completed and are inspected for defects and shipped.

Two recent developments have resulted in the production of two new types of records. One of these is the home recording record, which is a plain groove record having no music and can be recorded upon in the home by using the machines especially designed for this purpose. A microphone is supplied with an ordinary electric Victrola and the pickup is used both as a recorder and a reproducer, using a special blunt needle for both recording and reproducing.

Another type of record which has just recently been placed on the market is the long playing record. In these records the grooves are somewhat finer than the standard records and are considerably closer together. In this way more music is crowded into a given sized record. In addition to this these records are made to reproduce at 33⅓ r. p. m. rather than the customary 78 r. p. m. and this further increases the playing time of the record. A ten-inch record of this type plays for ten minutes and a 12-inch record for fifteen minutes.[1] Special reproducing needles with sharper points than the ordinary needles are required to reproduce them.

Efforts are constantly being made to improve the quality and usefulness of phonograph records and to simplify the manufacture of these records so as to make them of greater value and benefit to the consumers.

Discussion

F. C. Mesle: I would just like to ask about how wide that rubber ring is on the outside, and about how uniform the deposit, as the result.

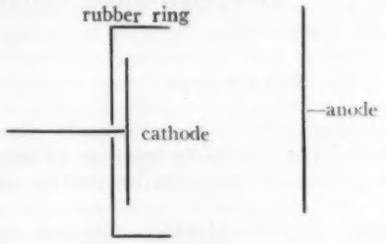
Mr. Dimon: The rubber ring projects, I would say, an inch and a half, approximately, forward of the surface of the matrix, and we are able to obtain uniformity of about 10 per cent. I would say, of the total thickness of the shell. That is, if your shell is .020" thick, the variation in thickness from the center to the inside would not be greater than .002". In some case, it would be a whole lot less than that, but it might be as great as that.

Chairman Graham: Might I ask, in that same connection, what variation in that figure would be obtained where the actual diameter of the record varies.

Mr. Dimon: I don't quite understand that.

Chairman Graham: In other words, if the ring is 1½" above the surface that is being reproduced, the amount of variation in the thickness of the metal over the surface is going to vary somewhat with the actual diameter of the record itself, is it not?

Mr. Dimon: That is what I was referring to. Perhaps I had better make this clear. [Draws diagram.]



Suppose that this surface (cathode) represents the matrix we are reproducing. That is mounted in a holder, a hard rubber holder, of circular character, and the anode would be hanging over here to the right. This ring prevents excessive deposition of copper here (at edge of cathode). Of course this whole thing is mounted on a spindle with a pulley on it, and is rotated, and that would give us uniformity in a concentric way. Does that answer your question?

Chairman Graham: Yes. Are all these records of the same diameter?

Mr. Dimon: Yes, except that there are 10" and 12" records.

Chairman Graham: Where that diameter varies, do you have to vary this ring?

Mr. Dimon: Yes, the rings used for 10" and 12" are different.

Chairman Graham: In other words, there is a variation in the distribution, with the diameter of the record and the actual width of that protective ring?

Mr. Dimon: Yes.

Charles H. Proctor: It would be interesting to know just about how much nickel they deposit on the master matrix.

Mr. Dimon: On the master matrix, the nickel deposit is very thin because that is actually in there as an inaccuracy, inasmuch as it is nickelplating rather than nickel facing. Probably it can be measured by three or four hundred-thousandths of an inch. It is just put in the bath a few moments, enough to give it a nickel surface. Of course, in the case of duplicate matrices, the matrices that are placed in the press, the nickelplating is much thicker.

Dr. William Blum: I would like to ask Mr. Dimon, what do you find the best separating medium for nickel from nickel.

Mr. Dimon: Dichromate, the same as electrotypers use for separating from lead molds.

Mr. Opplinger: The thought just occurs to me that that principal of the rubber ring around the record might be of some advantage, applied to chromium plating.

Chairman Graham: Of course, the use of a guard in chromium plating is common practice.

Mr. Opplinger: I know it is common practice, but the principle of extending and changing the length of the ring, depending on the diameter of the record, is a more or less new thing, as far as I am concerned.

[1]Records are now being made of a recently developed material known as Victrolac, which has considerably reduced the surface scratch or noise.

Protection of Aluminum by Anodic Treatment

By Dr. JOSEPH ROSSMAN
Washington, D. C.

A Review of the Patents Covering This Process Which Has Attracted Such Wide Attention — Conclusion*

British Patents

11. **Pollak;** 933 (1898). Aluminum is anodically treated in a bath of 3 per cent of bichromate of potassium. A 5 per cent soap solution may also be used as the electrolyte.

12. **MacGahan;** 23,007 (1908). Copper wire is coated with aluminum. It is then anodically treated in a bath of ammonium borate to produce an insulating coating.

13. **Bengough;** 223,994 (1924). Same as U. S. P. 1,771,910.

14. **Bengough;** 223,995 (1924). Aluminum is anodically treated as in British patent 223,994 after which the film is dyed. The dyeing operation may consist in immersing the article, which has been duly prepared by anodic treatment of the whole or a portion of its surface, in an aqueous solution of the dyestuff of say 0.1 per cent strength at the ordinary temperature, until the desired intensity of coloration has been attained; for example, blue may be produced by dyeing with anthracene blue or anthraquinone blue, and red by dyeing with alizarine red S. Generally, the sooner the dyeing operation follows the anodic treatment the better the result.

15. **Kenkyujo;** 226,536 (1925). Metallic aluminum previously washed and cleaned, is employed in an electrolyte consisting of an aqueous solution of 1 to 3 per cent of oxalic acid whether for both electrodes when alternating current is used, or for the positive electrode when a direct current is used, aluminum or other conductor being used for the negative electrode. In both cases, current density may be 0.05 to 0.1 amperes per square centimeter. An enamel-like skin of yellowish brown color having a metallic lustre is gradually formed on the surface of the aluminum. The thickness of the deposit is proportional to the current density and to the period during which deposition is allowed to take place.

When oxalates are used for the electrolyte, the current density is necessarily increased over that used in the case of oxalic acid. For example, in the case of an electrolyte consisting of an aqueous solution of 1 to 3 per cent of ammonium oxalate, direct current is supplied at 0.1 to 0.15 amperes per square centimeter, during a few minutes to several hours as desired.

16. **Gower;** 290,901 (1928). According to this invention the aluminum articles are subjected to anodic treatment in an electrolyte bath which contains a substantial proportion of sulphuric acid or of any substance which can give rise to sulphuric acid at an anode.

Any suitable coloring agent such as one or more of the following substances, bichromate of potash, hyposulphite of soda, acetate of lead, barium sulphite, sulpho-cyanide of ammonia, sulpho-cyanide of potash, may be added to the bath to color or tone the resistant coating. Ammonia or a salt of ammonia may be added to darken the color. The process is applicable to rough or machined castings and to rolled, spun, pressed or polished metal. The bath is preferably cold, i.e., at atmospheric temperature, at the start of the process, but its temperature should not be below 60 degrees Fahrenheit. The strength of the bath may be varied, but good results have been obtained with a concentration of 1½ to 2 pounds pure sulphuric acid per gallon of water.

The following directions give the best result at present known to us for treating pure rolled or cast aluminum and aluminum alloys containing not less than 85 per cent aluminum. If the object is not required to have a high polish it is first cleaned mechanically with an abrasive powder and brush to assure that all holes and cavities are free from dirt, but in the case of polished and rolled surfaces this step may be omitted. It is then immersed for a suitable time in a solvent for grease such as a boiling solution of brown potash and afterwards washed in cold or hot water.

The object is then connected with a source of electrical potential and made the anode in a bath comprising an aqueous solution of sulphuric acid of 10 per cent strength by volume, care being taken that the object is not put into the bath unless the electric current is on. The cathode may be of carbon or lead. The object may be suspended in the bath in electric connection by a thick copper wire, care being taken that the length of wire in the solution is as short as possible, or it may be suspended by wires of metals not attacked by the bath. In the case of big sheets, castings, or objects in which a coating of absolutely uniform appearance is not essential the object may be partially immersed and treated and then inverted so that the remainder of the surface may be similarly treated, the electrical connection in each case being made outside the bath. The voltage across the bath may be about 6 volts. With this voltage when the object is first immersed the current rises to about 10 amperes per square foot which rapidly falls to a steady current of about 2 amperes per square foot.

This bath is useful for obtaining a thick anodic coating in about 25 minutes, the color in general being a pearlish cloudy white, though it may be grayish on the alloy known as Duralumin or alloys of aluminum which contain silicon or tin. Other colors may be obtained, but they fade away after a few days' exposure. This bath moreover is useful as a preliminary bath in which the article may be treated for about 10 minutes to give it a preliminary uniform film and prior to subsequent treatment in other solutions which in some cases might give rise to pitting at the start if treatment was commenced in them.

Different shades of colors may be obtained from the

* Part 1 was published in the February issue.

same solution according to the time of treatment. If the treatment is prolonged to about 70 minutes a white or greyish metallic color may be obtained with any of the solutions herein mentioned. To obtain fancy shades of colors the metal after say 10 minutes treatment in one solution is taken out, washed in water and put in another solution for another 10 minutes and so on until the shade is obtained which experience has shown to be obtainable by such treatment.

The thickness of the coating may be increased by removing the object one or more times from the bath, drying it, exposing it to the air or to an atmosphere of oxygen, and again subjecting it to another treatment. The surface may be painted, oiled or otherwise provided with an additional protective film or skin of any suitable material.

Before being used all solutions should be allowed to stand for 24 to 30 hours.

A few of the many solutions which we have found applicable will now be given to facilitate carrying the invention into effect. (1) Dissolve hyposulphite of soda ¾ pound, acetate of lead ½ pound, bichromate of potash 1½ pounds, in water 1 gallon. When cold add sulphuric acid 1 pound 6 ozs. Let stand 24 hours.

Anodic treatment of aluminum or aluminum alloys in this solution:—for 5 minutes produces an iridescent green purple coating; for 15 minutes produces a bluish iridescent coating; for 30 minutes produces a white silver tinged pink coating; for 45 minutes produces a perfect white silver coating.

(2) Dissolve acetate of lead 1 pound, liquid ammonia 1½ ozs., in water 1 gallon. When cold add sulphuric acid 1 pound 10 ozs. Let stand 24 hours. Anodic treatment in this solution, for 5-10 minutes produces a bluish or light purple coating; for 30 minutes produces a bluish grey metallic coating; for 45 to 60 minutes produces a greyish white coating.

(3) Dissolve hyposulphite of soda 1 pound, sulphocyanide of ammonia 2 ozs. in water 1 gallon. When cold add sulphuric acid 1 pound 6 ozs. Let stand 24 to 30 hours.

Anodic treatment in this solution, for 10 minutes produces a light iridescent brown coating; for 30 minutes produces a bluish pinkish light brown coating; for 45 minutes produces a metallic white coating.

(4) Dissolve hyposulphite of soda ¾ pound in water 1 gallon. When cold add sulphuric acid 1 pound 6 ozs. Let stand 24 hours.

Anodic treatment in this solution, for 5 minutes produces an iridescent pearly coating; for 15 minutes produces a light blue coating; for 30 minutes produces a pearly white coating.

(5) Dissolve bichromate of potash 2 pounds in water 1 gallon. When cold add sulphuric acid 1 pound 10 ozs. Let stand 24 hours.

Anodic treatment in this solution, for 10 minutes produces a light rainbow coating; for 25 minutes produces a metallic white coating.

(6) Dissolve hyposulphite of soda ¾ pound, sulphate of ammonia 2 ozs. in water 1 gallon. Let stand 24 hours.

Anodic treatment in this solution, for 10-15 minutes produces an iridescent light brown coating; for 30 minutes produces a greenish blue brown coating; for 45 minutes produces a greyish white coating.

In order to obtain a hard white or silvery metallic looking coating, the article after anodic treatment for about 10 minutes in any of the other solutions may be subjected to anodic treatment in the following bath:—Sulphuric acid 1 pint, nitric acid ½ pint, water 9 pints.

The sulphuric acid is first added to the water and the nitric acid added when the solution is cold. The treatment may be at 4 volts which gives a current density of about 28 amperes per square foot.

17. Electrolux; 294,237 (1929). According to the present invention the treating process for the aluminum consists in submitting it to anodic treatment in an electrolytic bath containing a fluoride and submitting it to further anodic treatment in an electrolyte adapted to cause the metal to be chemically altered on its surface.

As electrolytes for the first bath potassium fluoride, sodium fluoride, and ammonium fluoride have proved to give the best results as they give the aluminum at the same time a certain protection against corrosion. Further color variations can be effected if the neutral fluoride solution is made acid or alkaline. As acid additions hydrofluoric acid is of especial importance. Alkaline additions also improve the process as they simultaneously increase the conductive capacity of the electrolyte and attack the anode to a less degree. The addition of ammonium carbonate, bicarbonate, ammonia or the equivalents thereof are preferred as they simultaneously give the aluminum an improved protective layer. An addition of about 1-5 per cent of ammonium carbonate solution has shown itself to be particularly advantageous.

One method of carrying out the process given by way of example is as follows:—The clean aluminum or like article is introduced into a 1 per cent solution of potassium fluoride which contains 1-5 per cent ammonium carbonate and as an anode is etched with a current strength of from ½ to 10 amperes, preferably 5 amperes. The usual supply voltage can be used as the voltage for the bath. The time of treatment after cleaning the object is ½-2 minutes. The article attains by this etching a beautiful matt color and is to some extent opened for the further subsequent treatment against corrosion. The object is washed for a short time in hot water and to increase the resistance to corrosion still further, is treated as an anode in, for example, an ammonium carbonate solution.

18. Kuttner; 329,190 (1930). Thick and strong oxide coatings can be produced electrolytically on articles of aluminum or aluminum alloys at a comparatively low expenditure of current if, instead of pure oxalic acid a mixture of oxalic acid and either oxidizing compounds or strong inorganic acids are employed.

The following is a specific example using a three-phase 120 volt circuit: At the free ends of the electrodes separate aluminum sheets were attached one to each electrode so as to plunge in the bath. The area of the single sheet was 35 square centimeters and the bath contained 35 grams of oxalic acid and 1 gram of permanganate of potassium dissolved in one litre of water at a temperature of 25 degrees C. The measured consumption of energy amounted to 1.9 Kw. After an experimental period of 40 seconds the three aluminum sheets were removed from the bath and found to be coated with a dense, uniform layer of brownish color, which firmly adhered to the metallic surface and acted to efficiently insulate the metal against an electric contact potential of 220 volt.

German Patents

19. Spezialfabrik fur Aluminum - Spulen und Leitungen; 264,534 (1913). Aluminum is anodically treated in a bath of oxalic acid to produce an insulating coating.

20. Bengough; 413,875 (1925). Same as U. S. P. 1,771,910.

21. Bengough; 413,876 (1925). Same as British patent 223,995.

22. Spezialfabrik fur Aluminum - Spulen und

Leitungen; 459,722 (1929). Aluminum wire is anodically treated in a bath of oxalic acid, chromic acid or any other suitable electrolyte. The wire is passed to and fro over pulleys in the bath so as to mechanically knead the oxide coating in order to make it flexible.

23. Jirotka; 471,053 (1929). Aluminum is anodically treated in a bath consisting of 5 grams chromium sulfate in 50 cc water which is added to 1000 cc. of nitric acid 1.40 sp. gr.

French Patents

24. Gesellschaft fur Elektrotechnische Industrie; 425,532 (1911). Aluminum wire is coated with an insulating film by anodic treatment in a bath containing sodium carbonate or bicarbonate.

25. Saint-Martin; 440,516 (1912). The electrolyte for treating aluminum contains 100 kg. water, 3 kg. sulfuric acid, 1 kg. iron sulfate.

26. Bengough; 583,844 (1925). Same as British patent 223,994.

27. Bengough; 583,862 (1925). Same as British patent 223,995.

28. Kenkyujo; 590,800 (1925). Same as U. S. P. 1,735,286.

29. Gower; 650,059 (1929). Same as British patent 290,901.

30. Kuttner; 675,527 (1930). Same as British patent 329,190.

31. Spezialfabrik for Aluminum - Spulen und Leitungen; 646,374 (1928). The invention is essentially the same as in German patent 459,722.

Summary

It will be noted that practically all the patents for the anodic treatment of aluminum have been granted during the last few years. A considerable amount of research is at present being conducted which will no doubt result in the issuance of more patents for this method of protecting aluminum.

Extrusion of Brass and Aluminum Tubing

Q.—WE are confronted with the problem of extruding brass and aluminum tubing of 2 inch diameter in 5 inch lengths. We would like complete data on the process.

In making the aluminum tubing, we start with a blank ⅛ inch thick, extruding in eight operations to 0.02 inch. We find it difficult to avoid producing an orange peel effect on the metal. Perhaps you can advise as to proper annealing for this purpose?

A.—Your problem does not state the kind of brass to be used in making the tubes. Assuming this to be either a two-and-one or a 70-30 copper-zinc alloy, low temperature and longer heat treatment will be correct.

The orange skin effect should be avoided on the brass. It is fundamentally caused by enlarged molecular structure that comes from the recrystallization of the metal during heat treatment. High temperatures and long exposure produce the coarser grained metal, and this is reflected on the surface of the metal when subjected to stress as in drawing or spinning.

Laboratory tests show that recrystallization starts at a temperature of 350° C., with a sixty minute exposure, while at 490° C., with a twenty-minute exposure the metal would be of a suitable temper to work, and still have a reasonably fine grain structure.

In mill practice the choice of time and temperature must be controlled by the type of furnace used, and changed to meet the reduced density of the material as the operation proceeds. Where the automatic tunnel furnace is used, and the units of metal are placed in shallow pans so that each unit is exposed and carried through the heat zone on endless chains, with variable speed control, a definite time to meet each reduction can be established and uniform temperature achieved. If the muffle type of furnace is used, with the material to be annealed in "pans" carrying a large amount of the shells, the time and the temperature can only be arrived at by trial and error. Use 490° C. as a maximum temperature, in order to avoid the orange peel effects.

Repeated annealing (between drawing operations) will not cause the "orange peel" if the grain growth is controlled at each annealing.

Much valuable information has been published on the "grain growth" under varying temperatures of the copper zinc alloys, and papers can be obtained through The Institute of Metals, 36 Victoria St., London, S. W. 1., or the American branch at 810 18th St., Washington, D. C., attention of W. M. Corse.

Through the courtesy of the Aluminum Co. of America, we are able to submit the following information regarding the grain growth in aluminum shells, produced by a series of drawing operations, and annealings as described in your letter of Oct. 5th.

"We do not believe it would be possible to anneal during drawing in such a way that you would not get grain growth. Grain growth can be reduced somewhat by certain variations in annealing practice, but when, as in this case, you have material which has been irregularly worked, and part of it only worked a very little, it will be almost impossible to avoid getting grain growth in the parts that have been worked only slightly."

The irregular working probably refers to a condition experienced in working other metals from a blank into a tube. The first cupping operation leaves the bottom of the cup unworked, and the succeeding forming operations still leave a large part of the material that will eventually form the walls of the finished tube subjected to a series of annealings in an unworked condition, with a resultant grain growth that can only be partly controlled.

The Aluminum Company of America makes tubes such as you describe, by an extrusion method similar to that used in making collapsible tubes. They are equipped to do this at much lower cost than by a process requiring several drawing operations, and the tubes will be free of the orange skin effect.

W. J. Pettis.

Calculations of Ampere-Minutes in Plating

By CHARLES H. ELDRIDGE

Electrochemist, Detroit, Mich.

A Set of Four Tables, Which Will Greatly Aid the Plater to Estimate the Proper Current Density to Use, and the Proper Plating Period for Any Desired Thickness or Weight of Deposit

MANUFACTURERS are demanding more and more a minimum thickness of deposit, or a minimum weight of deposit per sq. ft. It is then up to the plater to deposit such metal on the parts. Many manufacturers, especially the larger automobile companies, not only specify such a deposit, but actually test samples taken from production shipments and reject the whole lot if thicknesses or weights are below the minimum specified.

Current or Cathode Efficiency

There is another factor in plating that helps to confuse and puzzle the plater. I mean the current efficiency or cathode efficiency of the solution. Sometimes this value is high in one solution and low in another. Sometimes a change of temperature, or of current density, or a change of solution composition, will radically change the current efficiency. But why bother about this efficiency, you may ask? Here is the reason. Everything being equal, a high efficiency solution will plate faster than one with a lower value. Also a high efficiency solution is usually one in good working shape. This is certainly much to be desired.

What is meant by current efficiency in a plating solution? In a few words it means this. If the efficiency is 100 per cent, all the electrical power is used to plate and none is wasted in gassing and in other side reactions. But no one can plate with 100 per cent efficiency. Even the refiner who is much concerned with the size of his power bill, is glad to get 98 or 99 per cent.

Determination of Current Efficiency

Now the determination of the exact value of current efficiency is very precise and is for the Laboratory. A working value can be obtained in your plating tank, however, but a discussion of methods is outside the scope of this paper.

Let us presume that a Laboratory has run efficiency tests on your solution at your favorite current density and under your regular solution conditions. Suppose such values are 95 per cent for acid copper, 90 per cent for nickel, 95 per cent for cadmium, and 70 per cent for cyanide copper plating. If your values are much lower than the above, your solutions need additions, or are fouled with impurities, or are too hot, or are overloaded. In other words, determine your current efficiency, or assume it, and then we are ready to use the tables.

Table I — COPPER PLATING (Alkaline Solution)

Thickness	Wt. Oz. Per Sq. Ft.	Ampere-Minutes Per Square Ft. A	B	C	D	E	F	G	H	Wt. Gm. Per Sq. Ft.
.0001"	0.07	53	56	59	65	75	88	106	132	2.1
.0002"	.15	106	111	117	132	151	176	211	264	4.2
.0003"	.22	158	167	176	198	226	264	317	395	6.3
.0004"	.30	211	222	235	264	302	352	420	528	8.4
.0005"	.37	264	278	293	330	377	440	528	660	10.5
.0006"	.44	317	334	352	395	453	528	633	792	12.6
.0007"	.52	370	389	411	462	528	616	738	929	14.7
.0008"	.59	423	444	470	528	602	703	845	1060	16.8
.0009"	.67	475	498	528	593	678	792	950	1190	18.9
.0010"	0.74	528	557	586	650	753	878	1056	1320	21.0
Cur. Efficiency known or assumed		100%	95%	90%	80%	70%	60%	50%	40%	

Table II — CADMIUM PLATING (Alkaline Solution)

Thickness	Wt. Oz. Per Sq. Ft.	Ampere-Minutes Per Square Ft. A	B	C	D	E	F	G	H	Wt. Gm. Per Sq. Ft.
.0001"	0.07	58	61	64	73	83	97	116	145	2.0
.0002"	.14	116	122	129	146	166	194	233	291	4.0
.0003"	.21	175	184	194	218	249	291	349	437	6.1
.0004"	.28	233	245	259	291	332	388	466	582	8.1
.0005"	.36	291	306	324	364	416	455	582	728	10.1
.0006"	.43	349	367	388	437	499	582	698	873	12.1
.0007"	.50	407	428	453	510	582	679	815	1019	14.2
.0008"	.57	466	490	517	582	664	776	931	1164	16.2
.0009"	.64	524	551	582	655	748	873	1048	1310	18.2
.0010"	.71	582	612	647	728	831	970	1164	1455	20.2
Cur. Efficiency known or assumed		100%	95%	90%	80%	70%	60%	50%	40%	

Table III — NICKEL PLATING

Thickness	Wt. Oz. Per Sq. Ft.	Ampere-Minutes Per Square Ft. A	B	C	D	E	F	G	H	Wt. Gm. Per Sq. Ft.
.0001"	0.07	112	118	125	140	160	187	224	280	2.1
.0002"	0.14	224	236	249	280	321	375	449	560	4.1
.0003"	0.22	336	354	374	420	482	562	674	840	6.2
.0004"	0.29	448	472	498	560	642	750	898	1122	8.2
.0005"	0.36	560	590	623	700	800	935	1122	1400	10.3
.0006"	0.43	673	708	747	840	960	1122	1347	1685	12.4
.0007"	0.50	783	826	872	980	1122	1309	1572	1960	14.4
.0008"	0.58	896	944	995	1122	1280	1495	1795	2240	16.5
.0009"	0.65	1010	1060	1122	1260	1440	1680	2010	2520	18.5
.0010"	0.72	1122	1180	1245	1400	1600	1870	2244	2800	20.6
Cur. Efficiency known or assumed		100%	95%	90%	80%	70%	60%	50%	40%	

Table IV — COPPER PLATING (Acid Solution)

Thickness	Wt. Oz. Per Sq. Ft.	Ampere-Minutes Per Square Ft. A	B	C	D	E	F	G	H	Wt. Gm. Per Sq. Ft.
.0001"	0.07	106	112	118	133	152	177	210	265	2.1
.0002"	.15	212	223	236	265	303	350	425	530	4.2
.0003"	.22	319	335	354	398	455	530	640	790	6.3
.0004"	.30	425	446	472	531	607	710	850	1062	8.4
.0005"	.37	531	559	590	664	759	885	1062	1330	10.5
.0006"	.44	637	670	708	797	910	1062	1275	1600	12.6
.0007"	.52	744	782	826	930	1062	1240	1485	1850	14.7
.0008"	.59	848	894	944	1062	1214	1428	1700	2100	16.8
.0009"	.67	956	1005	1062	1195	1365	1600	1910	2400	18.9
.0010"	0.74	1062	1120	1180	1330	1517	1770	2124	2655	21.0
Cur. Efficiency known or assumed		100%	95%	90%	80%	70%	60%	50%	40%	

How to Use the Tables

The best way to explain the use of the tables is to run through a few calculations. Let us assume that a deposit of Cyanide Copper is wanted of at least .0004" before buffing, and that the efficiency of the solution is 60 per cent, which is a fair value. Using table I we then look in Column F, which is the 60 per cent column (as shown by the value 60 per cent at the bottom), and opposite the thickness of .0004" we find 352 ampere minutes per sq. ft. With a current density of 20 amperes per sq. ft., this will require 352 or about 18 minutes of plating time.

$$\frac{352}{20}$$

Such a deposit should show a thickness of at least .0004" before buffing, with a weight of 0.30 oz. per sq. ft., or 8.4 gm. per sq. ft.

In this connection it is worthy to note that the figure representing grams per sq. ft. is easily obtained mentally by doubling the figure representing the tenths of thousandths (of inches) of the deposit.

Following the same procedure a deposit of .0003" of nickel at 90 per cent efficiency would require 374 ampere minutes (see Table III, Column C), and .0002" of cadmium at 95 per cent efficiency would require 122 ampere minutes per sq. ft., (see Table II, Column B).

Conclusion

A very interesting generalization is noted if the two alkaline solutions, shown in Tables I and II, are compared with the two acid solutions shown in Table III and IV. On making a comparison of the 100% efficiency values, see Column A of each Table, we note that the acid solutions of nickel and copper require about twice as many ampere minutes per sq. ft. as do the two alkaline solutions.

The acid solutions, however, have higher commercial efficiency values than do the alkaline solutions, and this helps to even things up.

In concluding, the writer hopes that the above tables will be as helpful to the readers of the METAL INDUSTRY and to the platers with whom he has worked for many years.

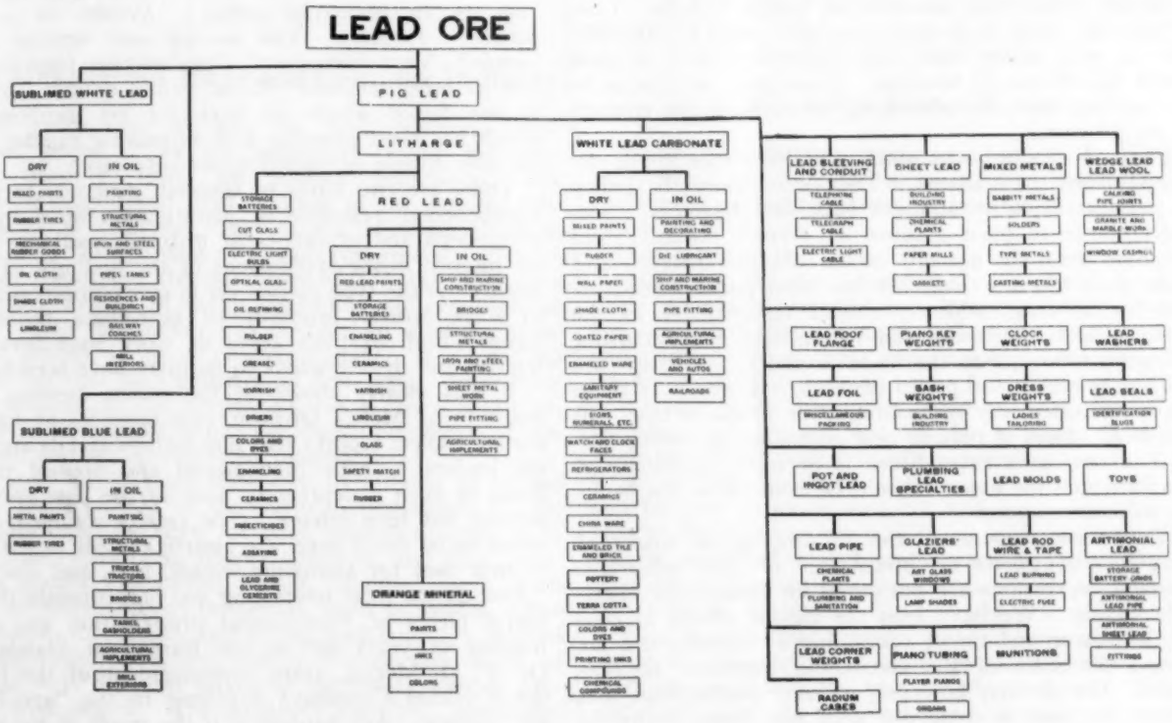
British Standards Institution

It has recently been decided to reorganize the work of the British Engineering Standards Association into four main divisions which will be responsible for the preparation of specifications in the engineering chemical, building, and textile industries. The Council has been granted a Supplemental Royal Charter authorizing these changes. In future, the name of the association will be the "British Standards Institution," and its activities will be under the control of a general council, which will have under it the four divisional councils. The work of the engineering division will, as before, be delegated to committees dealing with the main branches of the engineering industry, and will, for a long time, represent the larger portion of the Institution's activities. A. F

Uses of Lead in Ore, Metal and Derivatives

A Chart Showing the Great Variety of Products Taken from Lead Ore, and a Table Showing United States Consumption of Lead and Lead Products in 1931, as Compared with Former Years.

THIS CHART IS REPRODUCED THROUGH THE COURTESY OF THE EAGLE-PICHER LEAD COMPANY, CINCINNATI, OHIO



United States Lead Consumption*

	1913	1928	1929	1930	1931[1]
Batteries	10,000	220,000	210,000	163,000	146,000
(Primary metallic lead)	(6,000)	(83,000)	(81,000)	(56,000)	(50,000)
Cable	70,000	180,000	206,000	195,000	106,000
White Lead and Basic Lead Sulfate	114,000	136,000	130,000	96,000	83,000
Lead Oxides (excl. of batteries)	34,000	29,000	40,000	37,000	27,000
(Total oxides)	(38,000)	(116,850)	(124,000)	(102,000)	(85,000)
Ammunition	30,000	40,000	41,000	33,000	27,000
Foil	13,000	35,000	30,000	24,000	12,000
Pipe, Sheet and Fittings	213,700	290,600	78,000	58,000	37,000
Other Blue-Lead Products			213,500	147,600	106,000
Total	484,700	930,600	948,500	753,600	544,000
From Primary Sources	411,900	685,800	697,500	551,800	365,800
From Secondary Sources	72,800	244,800	251,000	201,800	178,200

Sources: American Bureau of Metal Statistics; U. S. Geological Survey; Lead Industries Association.

* From "Lead in the Depression," by Clinton H. Crane, president, St. Joseph Lead Company, in "Mining and Metallurgy," February, 1932.
[1] Estimated.

EDITORIALS

It Is Up To Business

The Government has now provided credit facilities for business which it can use to restore its health. The Reconstruction Finance Corporation, and the Glass-Steagall Act which broadens the scope of the Federal Reserve, are powerful deterrents to further deflation and will, without question thaw out the frozen credit situation, which has obtained for many months. Concretely, the result is to make available about $3,500,000,000 in new money and over $10,000,000,000 in new credit for the use of business. From now on it is up to the banking and manufacturing interests of the country to do the rest.

First of all the banks must meet legitimate credit demands from their clients. They must drop the policy of extreme liquidity and get back into business. Secondly, business must resume its former initiative and get back into the game. Is the old line played out? Then push the new one that has been under consideration for so long. Money should be available at the banks. Start advertising and selling, and manufacturing will soon follow upon the heels of orders. Perhaps the old line would go if prices could be reduced. Is there not some better way of making your products that will cost less? Does it require new equipment or better layout? If so, such expenditure is perfectly legitimate at this time, and the money should be available at the banks for solvent concerns.

We do not recommend the building up of stocks of manufactured goods or inventories of raw materials. Business depressions are not cured by kindness or charitable buying. We have seen the vicious effects in copper, lead, zinc and tin of continuing to manufacture far beyond the scale of the consuming interests' requirements. We do say, however, without qualification that this is the time to come out with new lines, improved products, and lower prices for old lines.

Once and for all let hoarding by responsible men and responsible organizations cease. It is understandable and in many cases forgivable that the small, financially weak individual, seeing the banks topple around him, will withdraw his cash and keep it in the back of the family clock. But there is not the semblance of an excuse for a corporation (as actually happened in one instance) to keep in its vaults $400,000 in gold. According to the estimate of the Administration in Washington, considerably over $1,000,000,000 has been locked up in this fashion. Let this money return without delay to the normal channels of business.

In the meantime, we have other forces at work. The United Action Campaign has put on a nation-wide drive to put 1,000,000 men back to work. If every employer would put back one man for every 20 on his present rolls, if every householder would contract now for the small repair jobs which have to be done eventually, and should and could be done now, these million men would be snapped up almost overnight.

In this bi-centennial year of the birth of George Washington, we cannot do better than to heed his injunction (which we perhaps forgot in our late heyday) that "nothing but harmony, honesty, industry and frugality are necessary to make us a great and happy people." Add intelligence to this list and put all of these qualities to work and our ills will be a thing of the past.

We have had great depressions in the past and recovered. We have had all of the evils present today—hoarding, panic, pessimism—and we have recovered. We will recover from this one. Our problem is only to make the recovery as rapid as possible.

Progress by Research

What is the leading factor today in our progress as an industrial nation? Wealth of raw materials? Perhaps. The energy and activity of our people? Very important. Our isolation from the quarrels of other nations? To a certain extent. But there is one factor which we have not yet mentioned, and which has been growing with increasing rapidity during the past fifteen or twenty years—Research.

There are two kinds of research generally carried on. Fundamental research is investigation into the basic phenomena and properties of materials, without immediate interest in the applications of the findings. Practical research is the type carried on in every progressive plant to solve special problems of immediate financial interest. Both of these types of work have been vastly fruitful and their rewards to industry have been huge.

It was clearly shown at the recent meeting of the Institute of Metals Division (see page 93 of this issue for a complete report) that non-ferrous metals are among the leaders in both fundamental and applied research. Even in such a depressing time as the past two years, activity has been intense. The results obtained, far too many to be listed here, are clearly evident in the spread of new uses for aluminum, nickel, lead, and zinc alloys.

One of the most interesting and subsequently the most useful pieces of fundamental investigation was done a number of years ago at the Bureau of Standards by Dr. P. D. Merica, (now vice-president of the International Nickel Company) resulting in the "age hardening" theory. Age hardening is the result of the precipitation of hardening constituents from solid solutions in an alloy, thus increasing its hardness with time. At the time this theory was enunciated it was of small practical importance, but this was over a decade ago. Since then, by the application of its principles, we have learned how to harden and strength almost all of the common non-ferrous metals. Even copper, that will-o-the-wisp for centuries, has yielded to its treatment.

Dr. Merica described the progress of age hardening in theory and practice in a Lecture delivered before the Institute of Metals Division. Here is a prime example of the benefits derived by practical plant operations (and consequently the financial interests involved) from fundamental, abstract research. Now we have work equally abstruse going on under the auspices of the large commercial organizations on aluminum, magnesium, nickel and even the rarer metals, such as beryllium, tantalum, etc. We have been told of a new method of magnetic hardening which accelerates the process of aging, in the case of Duralumin for example, so that the hardness attained in 12 hours is as great as that normally reached in 34 hours.

Nor has the idea of research stopped with manufacturing processes. Commerce has taken hold and is applying research, in the sense of investigation, in laying bare new uses for old products, and new fields of consumption which had hitherto been overlain by worn out customs.

To the field of non-ferrous metals as much as to any

Editorial Contents on Advertising Page 4

other in existence, research activity is absolutely indispensable. New steels have developed rapidly in the past few years and have made serious inroads on the territory formerly reserved to the "higher grade" materials. To combat these attacks, non-ferrous metals, copper, lead, zinc, nickel, and aluminum, have had to broaden their spheres of usefulness by acquiring some of the mechanical superiority, higher strength and hardness, in addition to their corrosive-resistant properties.

There are still many nooks and corners and perhaps several good sized areas, insufficiently developed among the metal industries. It is for these "backward states" to join the march of progress and keep in step with the times. No industry, if it does not reinvest a part of its surplus in development work, can continue to live in competition with its more virile and wide-awake contemporaries.

Ingot Making—A Huge and Complex Industry

Fifty years ago, we had the junk business. Today we know it as the secondary metal industry, grown steadily from its humble beginnings into one of the largest and most complex in our national life. Dr. James W. Furness, head of the Minerals Division of the U. S. Department of Commerce, recently released a report classifying the purchases of 327,000 short tons of various grades of scrap, according to geographical origin. That this survey was confined to what might be termed strictly scrap or secondary metal, is cleared up by the fact that he eliminates all new scrap, originating and consumed in the originating plants; new scrap returned to consuming plants by direct purchases of the material, and all second-hand material.

There is considerable difference of opinion as to the proper nomenclature of the various components of the secondary metal industry. A large amount of scrap finds its way into electrolytic copper refineries, and their product is always electrolytic copper, whether made from scrap or from primary materials, such as blister. For that reason, it is hardly fair to call such copper, produced electrolytically, secondary, simply because the origin of some of it is different from the electrolytic copper produced from blister. The output is identical. Moreover, the term "secondary" has carried with it for years, the stigma of being synonymous with the word "inferior." For a vast tonnage of castings and other products even the so-called casting copper (only 99-99½% pure) is fully the equal of electrolytic copper. Unquestionably the problem of a fair nomenclature will have to be solved.

The centers of this industry were found to be in the Great Lakes, the Middle Atlantic and the North Atlantic areas. The brass foundries are among the largest purchasers of secondary ingot although the fabricators also consume considerable tonnages. Most of the secondary smelters' output is in the form of brass and bronze ingots, but a large tonnage of secondary metal is sold without reduction or change in form, as it is of clear composition and its origin is known. Ashes, drosses, sweepings, screenings, etc., follow very closely in their amounts available, the prosperity or depressed condition of the secondary metal trades.

By and large it has become customary for the work of reducing scrap to ingot to be handled by the smelters rather than by departments in the individual plants. The smelters are generally equipped to handle huge quantities under continuous operation. They can operate more cheaply and show a saving to the producer of scrap, through the purchase of his material.

The industry has been greatly complicated by the large increase in the number of alloys in use during the past few years. As long as scrap consisted largely of the simple brasses and tin bronzes, the metallurgical problems were simple. With the advent, however, of aluminum bronze, complications began to appear. Now we have silicon-bronze, aluminum-silicon alloys, Duralumin, chromium plated brass, nickel bearing brasses and many others to make refining and simplification in the furnace much more difficult and costly. As a result the wide-awake smelters have re-doubled their efforts in the sorting departments and have watched very carefully the sources of their materials in order to avoid, as far as possible, contamination in the melting.

This condition will not abate but will probably grow greater as we go on. Consequently the secondary smelter will be more and more a technical and metallurgical plant rather than a strictly commercial venture. It is no longer possible to operate an ingot making plant without a good chemist. The day is coming when the industry will need also competent research metallurgists.

Plans for Better Times

Those organizations were wise which, in times of prosperity, prepared for a recession. Similarly, they are equally farsighted who, in times of depression, prepared for a revival.

It is a truism that those who are not ready for a turn in business, will not benefit by it. Only a sharp rise helps everybody, capable and incapable alike. But we are convinced that the turn will come only gradually, and perhaps for a time, imperceptibly. How then can we know that it is here and take full advantage of it?

We are fairly adequately supplied with statistics of industrial activity and will be able to know almost immediately if the index numbers start upward and continue in that direction. Orders will be more plentiful and perhaps larger in size. But there is one characteristic of these orders which will not have changed. They will be placed at rock bottom prices and the only ones who can sell at such prices will be those who have the best possible equipment for the job.

What is the point? Simply that it is time now to check up on the equipment and layout of manufacturing plants. Are your machines the best for the purpose? Is there something else on the market which can turn out the same product, at a lower cost? If there is, then your machinery is obsolete and you cannot compete with the man who has the latest machine. Is your layout the best possible, and your materials handled by as few as possible human hands? If not, your methods must be changed or you will find it impossible to operate profitably under the competition which is harder and fiercer than ever before.

This is in no sense a recommendation to expand production facilities. This is no time for increased capacity. Nor is it advice to put in a huge automatic machine to do a small amount of work of widely diversified character. It is simply an injunction to pick the best machine and the best layout for the type of work to be done. If it is small and highly specialized in character it may have to be done by hand. In that case, get the best possible man. If it is barrel plating work, see that it is done in a good barrel and not in hand handled baskets. If it is a large order of castings of one type, see that the molding is done on the right kind of molding machine. Is your present equipment in good repair or has it been allowed to depreciate too rapidly? See that it is brought back to its best operating efficiency.

These recommendations are not made with the idea of "making business." It is not a question of being kind to the equipment and supply houses. It is a sound dollars and cents earning and saving policy. Times are hard now but they will improve for the progressive and wide-awake. They will always be hard for the sluggard.

Correspondence and Discussion

Refining White and Red Metals

Editor, METAL INDUSTRY:

In reference to inquiry No. 3813 on advertising page 54 of your January issue:

We use sal ammoniac for removing aluminum from solders and other white metals. If aluminum is present in red brass it is blown out with air in a reverberatory furnace, together with iron and other impurities. We do not melt yellow brass in reverberatory furnaces, and if we happen to get aluminum in our yellow ingot, we remove it with barium sulphate.

If you get much aluminum in your white metals there must be something radically wrong with your metal sorters.

JAMES BRINN.

Chicago, Ill.

Good Information

Editor, METAL INDUSTRY:

Oliver J. Sizelove's letter and instructions in regards a Brightener for Brass Plating received quite a while ago, and I have followed the instructions to the letter as stated, and I am now turning out the most beautiful brass one could wish to see.

I have always used arsenic in barrel plating, but this is the first time in still plating, and I was very much surprised to see how nice it worked the first batch that came out. It is still working lovely at this date.

Thank you for the instructions.

C. L. PUFFER, Foreman Plater.

Rochester, N. Y.

New Books

Readings in Industrial Psychology. By Bruce V. Moore and George W. Hartman. Published by D. Appleton and Company. Size 5½ x 8½; 560 pages. Price, $5.00.

This is a collection of more than 200 original contributions on the applications of psychology to industrial management. It covers all phases of personnel selection and management, vocational guidance, the training of the worker, adjustment of working conditions and environment. The list of authors includes some very eminent names, among which are Henry Ford, Stewart Chase, Walter Lippmann, Joseph Jastrow, Samuel Gompers and H. L. Hollingworth.

Some of the significant sections are as follows: Popular vs. Scientific Procedures in the Matter of Appraising Men; Technique of Industrial Placement (Job analysis and specification, applications and records, the employment interview, etc.); Rating Scales; Mental Tests and Individual Placement; Motivation and Satisfaction in Work; Labor Unrest and Strikes.

The book adequately fulfills its purpose of making available both to the technician and the layman, the known facts in industrial psychology.

The Abolition of Poverty. By Harrison E. Freyberger. Published by the Advance Publishing Company. Size 5 x 7½; 152 pages. Price $1.50.

This is a small book which undertakes to solve a large problem, namely the equitable distribution of wealth. It describes the defects in our economic structure, such as mergers, the chain store, the concentration of wealth, and the exploitation of certain sections of the countries by others. The author offers among his remedies inheritance taxes to break up great fortunes, and the regulation of stock exchanges.

While many will agree with the author in his analysis of our social problems, few will refuse to join him in considering his remedies either correct or strong enough to cure us completely. The writer of such a book is under great disadvantage in these times moreover, being only one of a large number with full-fledged plans for curing all of our social ills.

Business Adrift. By W. B. Donham. Published by McGraw-Hill Book Company. Size 6 x 9; 165 pages. Price $2.50.

Even at a time when criticism is a common commodity and everyone with access to print is using it to the fullest extent to air his views and his cure-alls, we must nevertheless stop and take seriously the opinion of the author of this book who is Dean of the Graduate School of Business Administration of Harvard University. The author is fully aware of the defects of our present system. He is clear also about the dangers of our present situation, the competition that the system now in force has to meet, not only from within but from different systems operating abroad, such as dictatorships in the hands of extremists of one sort or another. The book is a warning of a liberal-minded adherent of our present order that unless we organize that order more shrewdly and take heed of problems which were once considered none of our affairs, there may be serious changes, fundamental in character, in one direction or another. Dr Donham pleads for long foresight. He offers a plan for American business to defend capital against democracy, which include planning, the development of home market and the stabilization of employment by emergency government action employing men in hard times at emergency wages.

The author's position and authority command respect and his opinions will be heeded by a large proportion of our liberal big business men.

50 Years of the Metallgesellschaft, 1881 to 1931. A book published to commemorate the 50th anniversary of the foundation of the Company, prepared by Dr. Walther Däbritz. Berlin 1931. Sold in commission by the VDI-Verlag. DIN A4. 304 Pages with 50 plates. 8 illustrations and 46 tables. Bound in Linen 12 Marks.

This book commences with a biography of the three founders, Wilhelm Merton, Leo Ellinger and Zachary Hochschild. After dealing in a general way with the structural changes of the metal industry during the last 50 years, the antecedents, the foundation, and the organization of the Metallgesellschaft are described.

The Metallgesellschaft is one of the German undertakings which suffered the most injury through the war, the greatest part of its capital having been invested abroad. Nevertheless the company succeeded in regaining its former importance soon after the end of the war.

The Dissatisfied Worker. By V. E. Fisher, and Joseph V.

Harper. Published by Macmillan Company. Size 5 x 7½, 260 pages. Price, payable in advance, $1.50.

The thesis of this book is that the large part of vocational maladjustment and industrial unrest are secondary to, and but a reflection of, emotional maladjustment. The authors discuss this type of person, as far as possible, without the use of technical terms or the introduction of complicated theories. They give a number of typical cases of maladjustment and its effects upon the labor turnover.

Most of the chapters in this book are devoted to the different kinds of individual maladjustments, their symptoms and effects. A suggested mental hygiene program comprises the last chapter of the book.

Metallographers' Handbook of Etching. By T. Berglund. Translated by William H. Dearden. Published by Isaac Pitman and Sons. Size 5½ x 8½, 172 pages. Price $3.75.

This little book of about two hundred pages is definitely more than a hand book, for while it fulfills all the requirements of a hand book for ready reference, it is at the same time written in an interesting and logical manner and has the effect of stimulating thought and encouraging research into the yet incompletely developed field of metallographic etching.

The data given are authoritative and complete. Compiled at the suggestion of the Society of Swedish Metallographers, the book contains data collected from the Swedish Iron Works and Laboratories, and technical articles in Germany, France, Great Britain and United States. The publications of the American Society for Steel Treating, the American Society for Testing Materials and the United States Bureau of Standards have been drawn upon liberally with meticulous care in the matter of acknowledging credit.

The text may be divided into three main divisions. The first under the title of "General Considerations" is an admirable discussion of the precautions required to produce a satisfactory metallographic surface. We find practical and helpful suggestions to the beginner; for example, "that should the final polishing require more than five minutes, at the most, then the previous grinding has been done incorrectly and a good surface can not be obtained." How often have we all struggled to obtain a satisfactory final polish when we would have been literally hours ahead by going back and repeating the preliminary stages of preparation. The reader will find much inspiration toward the development of improved metallographic technic in this first division of the book.

The second division contains chapters on the macroscopic and microscopic etching of iron and steel. Here we find a great variety of etching solutions and methods with due reference to their authors and critical comments by the compiler of the book.

The third division of the book concerns the etching of non-ferrous metals and here it is evident that the compiler has depended more upon the writings and experience of others than in the previous chapters of the book, but although the non-ferrous section is not treated as fully as the ferrous, yet a surprisingly large amount of data has been included in the twenty-nine pages devoted to this topic. We find for instance, methods of doubtful value, such as the determination of carbides, sulphides and phosphides in cast aluminum by a printing process similar to sulphur printing for iron and steel. We also find a statement attributed to this reviewer that final polishing of aluminum should be done on plush silk. To the contrary broadcloth, as we know it in this country, is much more satisfactory. Likewise in referring to the designation of constituents such as Fe-Si, a footnote states that the constituent consists principally of the elements indicated. It should be pointed out that all of these constituents are predominately aluminum so that the notation is intended to indicate a constituent of aluminum and the elements indicated.

The usefulness of this book as a reference is completed by an excellent bibliography and a ready index.—E. H. Dix, Jr.

Technical Papers

The Story of Nickel, by William H. Baldwin, International Nickel Company, Inc., 67 Wall Street, New York City. 44-page booklet, illustrated. Free.

Requirements of Airplane Coatings, by J. L. McCloud, Ford Motor Company, Dearborn, Mich. Paper presented at the 82nd meeting of the American Chemical Society, Buffalo, N. Y., 1931.

Age Hardening Copper-Titanium Alloys, by Earle E. Schumacher and W. C. Ellis, Bell Telephone Laboratories, 463 West Street, New York. Monograph B-635. An investigation of the age hardening properties of several alloys of copper and titanium.

Vacuum Casting, by H. T. Reeve, Bell Telephone Laboratories, 463 West Street, New York. Monograph B-624. A description of an apparatus with a capacity of several grams to two kilograms for the rapid melting and casting of metals in vacuum or gases.

Problems Involved in the Use and Production of Powdered Coal for Process Heating, by C. R. McClure, The Babcock and Wilcox Company, Cleveland, Ohio. Paper delivered before Conference on Industrial Process Heating, sponsored by Cleveland Engineering Society and Case School of Applied Science, February, 1932.

A reprint from the Journal of Chemical Education, giving the history of nickel, and its modern production and applications. Very well written, the story is worth the attention of all who are interested in metals. After the very interesting story of how nickel was discovered and came of age, the writer gives very extensive data on various methods of production, and the uses of the metal and alloys containing nickel.

Government Publications

Government publications are available from the Superintendent of Documents, Government Printing Office, Washington, D. C., to whom proper remittance should be made to cover price where a charge is mentioned. In some cases, as indicated, applications should be made to the governmental body responsible for the publication.

Fourdrinier Wire Cloth. Bureau of Standards, Commercial Standard CS36-31, a recorded standard of the industry.

Secondary Copper and Brass. Minerals Division, Department of Commerce, Washington, D. C. Survey for 1931. Copies on request to the Division.

Mutual Benefit Associations. Public Health Service, U. S. Treasury Department. A survey of the work of such associations, by D. K. Brundage, statistician. 5 cents.

Use of Zinc Oxide in Determinations of Cobalt and Manganese, by J. I. Hoffman, Bureau of Standards. Research Paper No. 380. 5 cents.

Aluminum Bronze Castings Specifications. Federal Specifications Board, Washington, D. C. Proposed revision. Manufacturers and others interested are asked to comment. Copies on request to Board.

Wire Cloth; Proposed Federal Specification, Federal Specifications Board, Washington, D. C. Comment of manufacturers and others interested is solicited. Copies on request to Board.

Retail Distribution in U. S. by Counties and Cities. Census Bureau, Washington, D. C. A 130-page booklet giving figures on retail activity in all cities and counties with over 10,000 population. Reported to be proving of great value to manufacturers and wholesalers who sell to retailers. Free on application to the Census Bureau while the edition lasts.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

SOLUTIONS SENT FOR ANALYSIS MUST BE PROPERLY PACKED, TO PREVENT LEAKAGE AND BREAKAGE. LABEL ALL BOTTLES WITH NAME AND ADDRESS OF SENDER. MAIL ALL SAMPLES TO 116 JOHN STREET, NEW YORK.

Black Nickel

Q.—Is there any method or agent for changing a part of a nickel plated article black, so that it will look somewhat like oxidizing?

It will be necessary to get a bright finished nickel on the part of this work that is not black.

A.—We would suggest the use of a black nickel solution to produce a black finish on a nickel plated surface as being the cheapest method.

You could copper or silver plate on the nickel plated surface and then oxidize the work in a sulphur solution to obtain a black finish. After oxidizing, a scratchbrush operation is necessary to produce a good black color.

The following formula for a black nickel solution will give good results:

Double nickel salts	8 oz.
Sodium sulpho-cyanide	2 oz.
Zinc sulphate	1 oz.
Water	1 gallon

Operate solution at room temperature, with ¾ to 1 volt.

O. J. S., Problem 5,072.

Brass Casting Practice

Q.—We are sending you under separate cover sample of casting to show you some of the troubles we have been experiencing. We do quite a lot of this high polish work, and you will note in some pieces something like scratches in the metal.

This is the mixture we have been using: 90 copper, 6 tin, 2 lead and 2 zinc, all absolutely new metal. We have mixed this formula ourselves before, and in order to overcome the trouble tried having it mixed by smelters, but in both cases it works the same.

We use graphite crucibles; tried them bottom poured but without success. In melting we keep the metal covered with charcoal; use pit self-draft furnace, with coke or hard coal. We melt a No. 50 crucible in about 3½ hours, sometimes less. We tried making the castings in green sand, skin dried moulds, and also French sand well dried. Will you please advise us as to what we do that is wrong?

A.—On examination of sample under the glass we find the metal porous; also, that this condition runs all through the metal in very fine form. You state new metal has been used. The mixture of the metal is one that should give very good results. So we are inclined to blame the method of melting.

Possibly the metal is not properly protected during the time it is exposed in the furnace. Be careful to use not less than one inch of charcoal. At any rate, the metal shows a mixture of oxides, metal comprising the alloy and suspended in same. The metal can be cleaned by the addition of an agent such as phosphorus. It will reduce oxides by robbing them of their oxygen. These, in combination with the phosphorus, become a fusible slag and rise to the surface of the metal, from which it can be removed by skimming. We suggest the use of 1% phosphor tin. It will greatly aid in cleaning your metal.

There is no question but that the cause of your trouble is in melting and handling the alloy. So take care in handling the alloy. We suggest the following: Use only new metal. Place all your copper in the crucible. Do not place copper around the crucible to heat before charging in crucible. Do not let any metal stick out of pot. Keep metal covered with charcoal. Melt the metal quickly. Get it good and hot. When copper is melted, add the phosphor tin, then lead. Stir and add balance of tin. Stir and add the zinc. Stir and pour at 2100° to 2150° F. Use a pyrometer if possible. Add a handful of salt just before pouring.

W. J. R., Problem 5,073.

Brightening Britannia Metal

Q.—One of our customers who makes Britannia metal products wants to know how he can get a brighter finish on his drawn goods. He says that the casting comes out clean and white, but as soon as it is formed up it becomes dirty and drosslike. He is having difficulty in competing with die cast metal, which maintains the bright, clean finish after drawing. Isn't there some acid in which he could dip the finished metal, which would not injure the Britannia and yet would give it the brighter color?

A.—We know of no acid or alkali dip that can be used to brighten Britannia metal. The trouble may be in the composition of the alloy used. An alloy of 90% tin and 10% antimony should not tarnish when exposed to the atmosphere.

O. J. S., Problem 5,074.

Casting Aluminum Around Steel

Q.—We want to cast pieces of steel into aluminum, and when pouring the aluminum on the steel, even when the steel is fairly warm, the aluminum just blows around where it touches the steel and frequently leaves the pieces loose. We do not expect a bond of any sort, but we would like to get the aluminum so it will lie close to the steel. In casting aluminum crankcases for internal combustion engines, we understand, they frequently put oil pipes and other parts in, sometimes going so far as to put bronze on steel bearing backing into the aluminum, and they are able to get the aluminum to cast close to it. Our understanding is that they coat the material with some substance before doing this. I am wondering whether your technical department can tell us what substance might be suitable.

A.—There should be no difficulty casting aluminum around steel, providing the steel is clean and free from scale or rust. However, wherever there is difficulty in casting aluminum around steel the practice is to tin the steel. This allows the aluminum to lie against the steel with the least disturbance. It also causes the aluminum to adhere to the steel. Iron pipes cast in aluminum crankcases are in many cases tinned.

W. J. R., Problem 5,075.

Furniture Hardware Finish

Q.—I enclose a brass stamping used for furniture hardware. This is an imported piece, from England, and is brought over all finished. How can we produce such a finish?

A.—The sample finish submitted is known as Old English, and is produced as follows:

Two solutions are necessary. One is made by using 1 oz. liquid sulphur and 1 gallon water. The other is made by using 2 or 3 fluid ounces of an old bright dip to a gallon of water.

After the work is polished it is cleaned in an alkaline solution, and then dipped into the sulphur solution for a few seconds. From the sulphur solution, without rinsing, it is dipped into the acid solution, and then rinsed in water. The alternate operations of dipping into the sulphur and acid solutions are continued until the color is dark enough when the work is dried, scratchbrushed and lacquered. O. J. S., Problem 5,076.

Plating White Metal

Q.—We have made up a metal composed of 44 pounds lead, 6 pounds tin, 7 pounds antimony. Some of the items we have made from this metal have been brass plated and some silver plated. So far, we have not had any trouble with those that have been brass plated. The pieces that we silver plated are all right when they are first finished, but after four or five days they begin to blister. We would like to know if you can give us any reason for this, or suggest anything we might do to the mixture to obviate the blistering.

We also make a metal in which we use 2½ pounds of hardening and 100 pounds of tin. By hardening we mean a metal which is made of 50 pounds of tin and 100 pounds of copper. We seem to have no trouble when plating this metal.

A.—You should have no trouble with the silver deposit blistering when plated upon an alloy having the composition you give, providing the work is properly cleaned and plated.

In cleaning the work use a mild cleaner. Then either nickel plate or use a special silver strike made of silver cyanide 0.25 oz., sodium cyanide 10 oz., water 1 gallon. Then use the regular silver strike and silver plate.

Another method that should produce good results is to plate the work for a few minutes in a warm cyanide copper solution before nickel plating, and then use the regular silver strike and silver plate. O. J. S., Problem 5,077.

Plating Wire for Drawing

Q.—Under separate cover, we are sending you two samples of silver solutions to be analyzed and two pieces of plated wire. One sample of wire is as it comes from the bath, the other after it is drawn through a diamond die.

In the drawing operations, considerable silver comes off the wire as it goes through the dies. In the final drawing operation the wire has a reddish tinge of copper. If the silver did not come off, we believe that there would be sufficient silver on the wire to prevent the reddish color. We have tried new dies and the same trouble occurred.

The solutions should contain in one litre 30 grams of pure silver and 20 grams of cyanide. To make up these solutions we used 5 ounces of silver cyanide with 1.79 ounces sodium cyanide per gallon of water. If we used 7.48 ounces of silver cyanide with 2.68 ounces of sodium cyanide or, in other words, a larger amount of both silver and cyanide in the same proportion in only one gallon of water, would the plating still be the same?

What would be the proper amount of free cyanide to have in the above solutions?

A.—Analyses of silver solutions:

No. 1.	Metallic silver	4.50 oz., (33 gm. per L.)
	Free cyanide	.99 oz., (7.4 gm. per L.)
No. 2.	Metallic silver	5.47 oz., (41 gm. per L.)
	Free cyanide	2.01 oz., (15 gm. per L.)

The metal content is too high and the free cyanide content too low in each solution for the class of work you are doing. We would suggest that you take one-third of the volume of the solution from No. 1 tank and replenish with water and add 3 ounces of sodium cyanide to each gallon of solution. For No. 2 solution, take ⅓ of the volume of the solution from the tank, replenish with water, and add 2 ounces of sodium cyanide to each gallon of solution.

If you use 5 ounces of silver cyanide and 1.79 ounces of sodium cyanide to each gallon of solution, you are not using enough sodium cyanide to dissolve the silver cyanide. To put the 5 ounces of silver cyanide into solution it would require about 5 ounces of sodium cyanide, and then you would have to add the proper amount of sodium cyanide for free cyanide. The free cyanide content should be somewhat greater than the metal content.

O. J. S., Problem 5,078.

Pink Gold Plate

Q.—Can you tell me how to produce a pink gold plate? I have calls to plate eye glass frames in such a color.

A.—We can give you no information on how to make a pink gold solution as this is the first time that we have ever heard of it.

If you will send us a sample of such a finish, we may be in a position to help you. O. J. S., Problem 5,079.

Refinishing Headlights

Q.—What is the best method used in replating and finishing automobile headlights? What plating solution and formula is used? What compound is commonly used for buffing?

Is the plating solution that I use suitable for the job mentioned? It consists of the following: 1 gal. water, 16 oz. nickel salts single, 2 oz. boric acid, 2 oz. table salt.

I have in stock some silver chloride and would like to have the formula for silver solution to be used as a finish on the above mentioned job.

A.—In refinishing automobile headlights the first operation consists of removing the old deposit of nickel and silver. This may be accomplished by a polishing method or by stripping in a dip made of sulfuric acid 5 parts and nitric acid 1 part. This strip should be used hot, and water must be kept out of the dip. If the strip method is used, the work should be polished and colored.

After polishing and coloring, clean by the use of an alkaline cleaning solution, and then plate in a nickel solution for five minutes. You can probably use the nickel solution that you have, but the following formula is recommended:

Double nickel salts	8 oz.
Single nickel salts	4 oz.
Sodium chloride	2 oz.
Boric acid	2 oz.
Water	1 gallon

The work is rinsed thoroughly in clean, cold water after nickel plating, and then struck for a few minutes in a silver strike, after which it is plated for five minutes in the silver solution.

Formula for silver strike:

Sodium cyanide	8 oz.
Silver chloride	½ oz.
Water	1 gallon

Formula for silver solution:

Silver chloride	3½ oz.
Sodium cyanide	8 oz.
Carbonate soda	2 oz.
Water	1 gallon

After the work is silver plated, it is colored, using a cotton flannel or soft muslin wheel with lamp black moistened with alcohol as the coloring medium.

There are also silver coloring rouges that are used for coloring silver plated work, and these may be had from advertisers in METAL INDUSTRY (see Buyers' Guide).

O. J. S., Problem 5,080.

Removing Vitreous Enamel

Q.—We would like to know if the old vitreous enamel can be removed by some acid instead of a sandblast machine, and if so what acid we must use.

A.—The vitreous enamel can be removed by the use of hydrofluoric acid. If this acid is used, it must be kept in a wood- or lead-lined tank. Care should be taken in using the acid, as when it comes in contact with the body very painful sores are produced.

We believe that removing the enamel with the acid would be more expensive than with the sand blast.

O. J. S., Problem 5,081.

Patents

A Review of Current Patents of Interest

Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,837,355. December 22, 1931. **Electrodeposition of Alloys.** Robert M. Burns, Brooklyn, N. Y., and Clarence W. Warner, Glen Ridge, N. J., assignors to Bell Telephone Laboratories, Incorporated, New York, N. Y.

In an apparatus for electrodepositing nickel-iron alloys, an anode of nickel, a second anode of iron and a cathode immersed in an electrolyte composed of nickelous sulphate, ferrous sulphate, nickelous chloride, ferrous chloride, sodium sulphate and boric acid, and means for applying a potential between said cathode and said anodes.

1,838,126. December 29, 1931. **Alloy.** Victor Wyldes, Toronto, Ontario, Can.

A process of producing an alloy of the class described consisting in melting and heating 5 lbs. 10 ozs. copper successively at two-minute intervals 3 ozs. fuller's earth, 7 ozs. borax, 3 ozs. white precipitate, 12 ozs. tin, 3 ozs. magnesia, and 1 oz. alcohol, mixing the resultant mass for about thirty-five minutes, and boiling it for about forty minutes.

1,838,145. December 29, 1931. **Smelting Furnace.** Arthur Jones, Belleville, Ill., assignor to U. S. Smelting Furnace Company, Belleville, Ill.

In a device of this class described, the combination with a furnace supported by means permitting rotation thereof on a substantially horizontal axis, of a burner for said furnace provided with a nozzle discharging in the direction of the length of the furnace, said nozzle being inclined to the axis of said furnace to direct the flame upwardly at an acute angle to the surface of the contents of said furnace, and a return passage for the products of combustion adjacent said nozzle.

1,838,187. December 29, 1931. **Apparatus for Electroplating Articles of Elongated Contour.** John W. Moon, Butler, Pa., assignor, by direct and mesne assignments, to Fretz-Moon Tube Company, Inc., Butler, Pa.

In an apparatus for electroplating articles of elongated form, the combination with a tank and vertically extending anodes; of a row of supports turnable on vertical axes and on which said articles are adapted to be supported in proximity to and in substantial parallelism with said anodes, means for engaging the upper ends of the articles to hold them in vertical position, and means for oscillating the supports.

1,838,241. December 29, 1931. **Electrodeposition of Rubber.** William Arthur Williams, Edinburgh, Scotland.

A process for the production of rubber or a homologous substance by the electro-deposition of a vulcanized or unvulcanized latex, which consists in introducing zinc and carbon electrodes into the latex, utilizing in or adding to the latex ammonium chloride in insufficient quantity to cause coagulation, and applying to the electrodes an external source of current of such voltage that the total difference of potential between the electrodes shall not be greater than is sufficient to decompose water.

1,838,368. December 29, 1931. **Lacquer Composition.** Joseph G. Davidson, Yonkers, N. Y., assignor to Carbide and Carbon Chemicals Corporation, a Corporation of New York.

A lacquer containing a cellulose ester, a product soluble in toluene, benzene and butyl acetate and resulting from the polymerization of a mixture of vinyl acetate and vinyl chloride, and a cellulose ester solvent.

1,838,370. December 29, 1931. **Soldering Flux.** Reginald Scott Dean and Roger Verden Wilson, La Grange, Ill., assignors to Western Electric Company, Incorporated, New York, N. Y., a Corporation of New York.

A soldering flux containing a halogen derivative of a carbon compound which is inactive below the range of soldering temperatures.

1,838,527. December 29, 1931. **Electric Induction Furnace.** Guilliam H. Clamer, Atlantic City, N. J., assignor to Ajax Electrothermic Corporation, Ajax Park, N. J.

The method of heating and stirring the charge in the pool of an electric furnace from the bottom to the top, which consists in heating at a distance from the pool a part of the molten metal continuously connected with the pool to receive molten metal from the pool, in delivering the same molten metal back to the pool after heating it and in stirring the molten metal electrically separate from the stirring given it by delivery from the part, and in generally vertical planes, to mix the different depths of the pool, one with another.

1,838,632. December 29, 1931. **Method of Decreasing Shrinkage in Aluminum Bronze Castings.** Aladar Pacz, East Cleveland, Ohio.

Method of preparing an alloy containing copper 87% to 93%, aluminum 3% to 9%, silicon 1½% to 2½% and iron 1% to 3% characterized by first melting together the copper, aluminum and silicon, and finally adding the iron after the copper and aluminum have become melted together.

1,838,633. December 29, 1931. **Coloring Aluminum Alloys.** Aladar Pacz, Cleveland, Ohio.

A dipping solution for the production of a colored protective coating on the surface of articles made of aluminum-containing alloys which contains a small amount of a soluble dichromatic salt, not exceeding .02% of the weight of the solution in company with at least about 1.5% of alkali carbonate or hydroxide.

1,838,666. December 29, 1931. **Electroplating Apparatus.** Colin G. Fink, New York, N. Y., and Charles H. Eldridge, Metuchen, N. J.

An apparatus for electroplating comprising an electrolytic tank for electrodepositing metal on an article immersed in the electroplating solution therein, a hood or container for gas mounted above said tank, said hood having a height greater than the height of the article being electroplated in said tank, closure means adapted to close the bottom of said hood, means for transferring the article undergoing electroplating from said solution to said gas container and back again to the solution, and means for reducing the pressure in said hood or container after the article is transferred into said hood and after the aforesaid closure means are closed on the bottom of said hood.

1,838,777. December 29, 1931. **Chromium Plating.** John F. K. McCullough and Benjamin W. Gilchrist, Detroit, Mich., assignors to Ternstedt Manufacturing Company, Detroit, Mich., a Corporation of Michigan.

A process for chromium plating which comprises passing an electric current through a bath with a chromium anode and formed by dissolving in water chromic chloride and one or more of the alkaline metal and earth metal chlorides, and oxalic acid together with nitric acid.

1,839,488. January 5, 1932. **Cleaning of Metallic Parts.** Sumner Redway Mason, Wilmette, Ill., assignor to Western Electric Company, Incorporated, New York, N. Y.

The process of cleaning metal parts, which consists in immersing them in a sodium hydroxide solution at about 200° F. while passing direct current from the parts through the solution, then immersing them in a solution of hydrochloric acid and formaldehyde while passing alternating current through the hydrochloric acid solution to the parts, and then immersing them in a cyanide solution at about 160° F.

1,839,686. January 5, 1932. **Alloy for Pen Points.** Kurt K. Ledig, Newark, N. J., assignor to American Platinum Works, Newark, N. J.

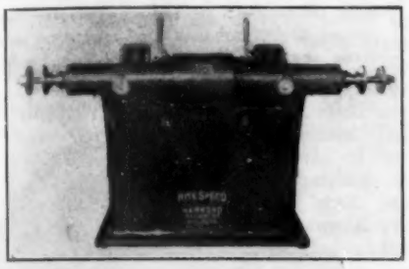
As a substitute for osmium-iridium, a hard alloy having a durable wearing surface and containing 50 to 80 parts of ruthenium, 10 to 40 parts of osmium, and the rest 2 to 10 parts of other metals selected from the platinum group.

Equipment

New and Useful Devices, Metals, Machinery and Supplies

Polisher with Independent Overchanging Spindles

Hammond Machinery Builders, Inc., Kalamazoo, Mich., has added to its line the "Rite Speed" polishing and buffing lathe with two independent overhanging spindles, known as Type CCO, for use with two



New Hammond Polisher.

motors, in ratings of 3, 5, 7½ or 10 horsepower each. These heavy duty machines are stated to have the advantages of maximum working space around spindles; independent spindle operations; any desired spindle speed; screw feed slide rail belt tension adjustment on rear of pedestal; standard or "Cascade" lubrication system, as desired.

The machine is especially recommended by the maker for use where wheel changes are frequent and where wide variability of speed is required.

Rex Solvent Washing Machine

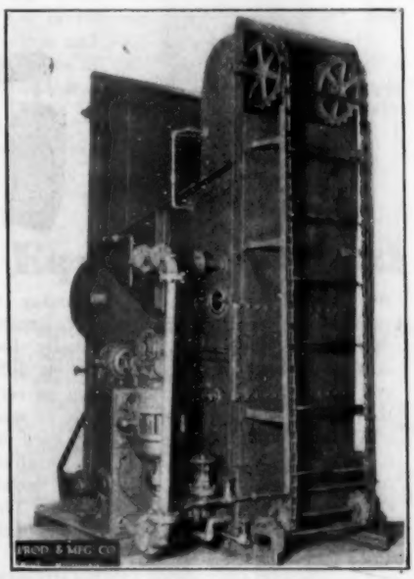
An improved design of the solvent washing machine, known as the vertical type, is offered by the Rex Products and Manufacturing Company, Detroit, Michigan. The vertical type washer is short coupled. It is recommended for use where floor space is very limited, and for operation by a single operator, who can place dirty work on conveyor or fixtures, and remove clean work, which is returned to the operator.

The cleaning solvent used is known as "Perm-A-Clor," it is non-explosive, non-inflammable, permanent in quality, and acid free in both liquid and vapor form.

Work is placed on the conveyor, with or without fixtures, at the right of the machine, and passes downward into the machine between powerful streams of boiling solvent striking the work from all directions at a pressure of 35 lbs. per square inch. Work and conveyor then pass over and upward, permitting work to drain, then through a rinse of distilled, hot solvent, after which it passes upward and leaves the machine clean and dry. Work may be removed from conveyor at left of the machine, or allowed to pass under machine and return to operator for removal.

After the solvent in pumping chamber has been contaminated with an accumulation of oil and foreign matter, the flow-back pipe from the rinsing chamber is shut and the distilled solvent is drawn off into a reserve tank until all of the solvent in the pumping chamber has been distilled or evaporated, leaving only a sludge and the accumulation of dirt in the pumping chamber. Dirt and oil are then removed by removal of a plate on pumping chamber. After cleaning, the plate is again fastened to machine and the clean distilled solvent drained back into pumping chamber from rinse and reserve tanks. Machine is then ready for operation with clean solvent. The method of cleaning, together with the condensers at the opening of the machine, keeps the loss of solvent at a minimum, it is claimed.

The process is said to be most suitable for cleaning zinc or lead coated metals,



New Rex Washer.

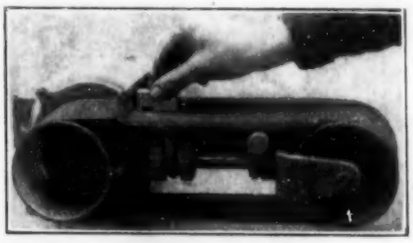
aluminum die castings or soft metals which are affected by ordinary alkali cleaners, as well as removing lubricating oils from machined, stamped or quenched parts, or buffing compounds, before painting, lacquering, enameling, plating vitreous enameling or other finishing.

Machines are designed and adapted for any particular kind or class of work or cleaning.

Complete information on this equipment is available from the manufacturer.

Abrasive Belt Surfacer and Polisher

Production Machine Company, Greenfield, Mass., has developed a new abrasive belt surfacer and polisher for bench mounting, said to be a shop tool of simple design and low upkeep cost, for surfacing,



Belt Surfacer for Metals.

burring, squaring up, etc., giving a straight line finish with sharp, clean edges. The machine is applicable to wood as well as metal finishing. The machine is known as No. 601. It consists of an abrasive belt unit directly connected to motor, with cord for plugging into lighting fixture. No connections or attachments are needed. The machine carries face pulleys of 4 in. diameter, 4½ in. face; has work table 7½ by 4½ in.; adjustable gauge; endless abrasive belt is 35 in. long, 4½ in. wide.

New Rheostat for Precious Metal Plating

A new type of plating tank rheostat, designed to give the accurate regulation of current and voltage required for the proper deposition of gold, silver, rhodium and other precious metals, is now being placed on the market by The Columbia Electric Manufacturing Company, 1292 East 53rd Street, Cleveland, Ohio. The new rheostat is made in current capacities up to 25 amperes, and is built on the potentiometer principle. By varying the position of the sliding regulator contact, the current may be readily stepped up or down within the entire range of the rheostat's capacity in gradations of from 0.05 amperes to 0.15 amperes, and the voltage adjusted within 0.05 volt—depending, of course, to some extent upon the resistance of the tank solution, the maker states.

Another advantage claimed for the new rheostat is that the voltmeter is connected to show, before current is applied, the approximate full load voltage. In gilding and other work where over-voltage may have a marked effect on the color and

quality of the deposit, this is said to be a great advantage.

Bench Type Tumbler

The Baird Machine Company, Bridgeport, Conn., offers the bench type oblique tilting tumbler, belt or motor driven, for various tumbling processes as well as ball burnishing. The machine can be furnished with either cast metal barrel or barrels of other materials, in sizes and shapes to suit various types of application. More than one barrel can be supplied for a single machine, to provide for different jobs. Either polygonal or round barrels are available, in covered or open-mouthed design.

The bench machine is made in two sizes: 2 quart and 3 quart work capacities.

Baird Bench Tumbler.

Either size requires approximately 12 by 17 inches of bench space, and weighs about 130 lbs. complete. One-eighth horsepower, 1725 R.P.M. motor is provided. Barrel is held by a notched segment and locking bar arrangement, and can be rotated in any of eight angles from vertical to 20 degrees below horizontal.

Herringbone Pinions as Pump Rotors

Farrel-Sykes herringbone gears have a world-wide reputation for use in the transmission of power. They have, however, other applications which are not so well known, according to Farrel-Birmingham Company, Inc., Ansonia, Conn., the makers. A pair of pinions of this type can be used as impellers, sometimes called cams and rotors, for the gear type of pump. Farrel-Sykes gears are said to be used in thousands for this purpose by many of the best pump makers as standard. Numerous advantages are claimed, including more mechanical and volumetric efficiency. They can run at a very high speed. Smaller size pumps are used with motors direct connected to them, running up to 1800 r.p.m. Such pumps are often used for high pressures; 1,000 lbs. per square inch is standard with some makers using Farrel-Sykes gears, and in some special cases the gears are used for pressures up to 1,500 lbs. per square inch.

Application of Farrel-Sykes gears to large capacity pumps has recently become general. The gears can be run at 435 r.p.m., to pump 625 gallons per minute against a head of 200 lbs. A pump of this kind is said to make a simple and efficient installation, very small for its capacity. No reduction gears are required, and it is consequently economical to manufacture.

Farrel-Sykes pump rotors are made in a variety of materials, including bronze, high carbon forged steel, nickel-alloy cast iron, and various alloy steels including "Nitralloy."

Abrasive Metal Cutter

The Bridgeport Safety Emery Wheel Company, Bridgeport, Conn., has developed a new type of metal cutting machine embodying an abrasive disc to take the place of a circular saw or other cutter. This is known as the "Abrasaw" cutting-off

Abrasive Metal "Saw."

machine. It is stated by the maker to provide a high efficiency, high speed metal cutter which operates at unusually low cost and works on metals heretofore difficult to saw. Incredibly fast action on very thin sections, usually very difficult to saw, and quick, cool sawing of very hard or tough metals such as alloy steels, machine tool bits, drills, tools, Allegheny metal, etc., are other advantages claimed. The machine is also said to be peculiarly well adapted to cutting non-ferrous metals.

The machine consists of 7½ horsepower, 3,600 R. P. M. motor, producing disc spindle speed of 5,200, and wheel speed of 16,000 R.P.M. The disc head and drive motor balance each other, to form an easily rocking head. A table with swiveled vise is provided. Table can be set at any desired angle, or removed to permit use of other types of holding arrangements. The vise is roughly adjusted to size of work by a hand crank, and work is held during operation by means of foot treadle and draw rod, for fast operation and freedom of operator's hands. Table is sufficiently large for long work and variety of forms. Cutting discs 12 in. by 3/32 in. with 1 in. hole are standard; 14 in. or 16 in. discs are available, for use with special guards and driving sheaves. Guards are said to provide maximum protection from injury, including possibility of a bursting wheel. Sparks or chips are caught. All parts are protected from dust, abrasive particles, etc.

All-Purpose Motor Tumbler

Lasalco, Inc., 2828 Lasalle Street, St. Louis, Mo., offers the "Lasalco" all-purpose motor tumbler, said to be a low-cost machine for general tumbling of metal parts and products. This machine is made in two sizes, and can be supplied with either wood or steel tub, for operation either wet or dry, in such work as washing, rinsing, drying, etc. It can be had with either A.C. or D.C. motor, and sieve covers are obtainable for separating work from sawdust or other tumbling medium employed.

The machine is stated to be easily installed and operated. Lever and ratchet device is provided for easy and rapid raising and lowering of tub, with counterweight to facilitate such adjustment. V-belt drive from motor to sheave pulleys also add to the machine's efficiency, it is stated.

Lasalco Tumbler.

American Brass Making Range Boilers

In 1876, the first Brown and Brothers seamless copper range boiler was placed on the market. It was revolutionary in design and construction, and established a standard of quality which has never been excelled. Three years ago The American Brass Company, Waterbury, Conn., bought the business and equipment of The Randolph-Clowes Company, and acquired the Brown and Brothers boiler. Except for two improvements in design and an

increase in metal thickness, Brown and Brothers boilers today are essentially the same as when they were introduced 56 years ago.

The boilers are made of two seamless, cold drawn shells of deoxidized copper, which are telescoped together under tremendous hydraulic pressure. There is only one seam, a girth seam in the center of the vessel, which is secured with an interlocking cup joint, caulked with solder. For further reinforcement, a heavy copper band is shrunk over the seam. The interlocking cup joint is an innovation, as the seam was formerly riveted. Spuds and connections are screwed into heavy threaded joints, which is the second change in design. All boilers are finished with a thick coating of tin inside.

One reason that Brown and Brothers boilers have retained distinctiveness of design for over half a century is that its makers have had the only equipment in this country for drawing the shells from which the boilers are constructed. This equipment consists of a series of massive hydraulic rams, on which the shells are drawn down to the various diameters. The shells are started from a circle of hot rolled copper, its thickness depending on the diameter for the finished shell. As the shells are formed and drawn down, the walls are reduced in thickness, but the heads are finished with practically the same thickness as the original circle. The boilers meet a 300-pound test pressure.

Permanent Patina for Copper and Alloys

The copper industry seems at last to have discovered nature's process for giving copper and its alloys a permanent green coloration, or patina, after hundreds of attempts to duplicate it by artificial means. Heretofore, while the coloration could be matched, the secret of making it last and protect had baffled the experts, says the Copper & Brass Research Association, 25 Broadway, New York.

The secret is now known, and application has been made for a patent on the process that does it in a few hours. Production methods for commercial utilization of the treatment are being rapidly developed.

Research has disclosed that the patina developed on copper and its alloys by natural weathering is principally the basic sulphate of copper, it is stated. It had always been believed that the patina was a basic carbonate of copper, and this was what they had attempted to reproduce. They obtained the patina, but it never was the complex, basic compound produced by nature. The patina produced by the new process is said to be identical with that produced by natural weathering, nature still doing its part, but working faster.

Within a short time, it is expected, copper sheet metal work weathered to permanent natural patina will be available for buildings. Statuary and art objects will also be produced with the coloration and permanent semblance of antiquity.

Details of the process have not been made public.

New "U. S." Lathe Grinder

Among the products being offered by distributors now is a new lathe grinder made by The United States Electrical Tool Company, 2462 West 6th St., Cincinnati, Ohio.

This machine is built for use on lathes from nine inches up and having a compound rest. It is used especially for

New "U. S." Lathe Grinder

grinding centers, reamers, dies, rolls, small shafts and similar equipment. It can also be used on shapers, planers and boring mills.

The motor is ¼ H. P., with speed of 5200 R.P.M. Machine is built for 110 or 220 volts, A.C. or D.C. (1, 2 or 3-phase A. C.). Ball bearings, rugged construction, and well-balanced distribution of weight are said to assure true, vibrationless operation and long life.

Detailed information and prices are obtainable from distributors, or by writing Dept. 80, The United States Electrical Tool Company.

Developments in Metals

ALUMINUM hopper car, first of its kind, was recently completed for Aluminum Company of America. Considerable weight is saved, giving car about 21,200 pounds extra pay load capacity, as compared with steel cars.

PORCELAIN ENAMELED STEEL will be used in construction of a house sponsored by Ferro Enamel Corporation, Cleveland, Ohio. Projected plan is to provide houses by mass production is proved practical.

WATER was drawn into a thread as strong as brass wire at the cosmic ray exhibit in connection with the annual meeting of the American Association for the Advancement of Science, held at New Orleans recently. Liquid mercury was drawn in a wire as strong as steel.

TWO BRASS STRIPS twenty feet and eighteen feet long and seven-eighths inch wide were inlaid in a terazzo marble monument in the Brooklyn, N. Y., Botanic Garden, to mark Brooklyn's exact geographical location.

ALUMINUM will be used for one-sixth of the exterior surface of the ten buildings of Radio City, great Rockefeller development in New York; 22,000 spandrels have been ordered from Aluminum Company of America.

ALUMINUM cable is being used in the new power transmission line between Albany and Westchester County, N. Y.; about 858 miles of the cable will be required.

TIN PRODUCTION of the world in 1931, expressed in terms of recoverable metal contained in ore, amounted to 147,670 long tons, according to an estimate by the American Bureau of Metal Statistics. Production in 1930 amounted to 174,668 long tons, and in 1929 the output reached 192,197 long tons.

Equipment and Supply Catalogs

Mill Rolls. United Engineering and Foundry Company, Pittsburgh, Pa. Bulletin R-1001, roll list.

Instruments. The Bristol Company, Waterbury, Conn. Catalog 4001, Free vane, air-operated recorder controller.

Corrosion of Aluminum Alloys. The National Smelting Company, Cleveland, Ohio. Bulletin A6. Technical information.

Air Conditions and the Comfort of Workers. Metropolitan Life Insurance Company, New York. Industrial Health Series, No. 5.

Gas Producers. Semet-Solvay Engineering Corporation, 40 Rector Street, New York. Bulletin 45, on Koller type gas producer.

Copper Plumbing Fittings. Parker Appliance Company, 10320 Berea Road, Cleveland, Ohio. Bulletin 39, on a new line of fittings.

Degreaser. Carrier Engineering Corporation, Newark, N. J. Bulletin describing the Carrier vapor degreaser for cleaning metal and other products.

Gas Indicator-Recorders. C. J. Tagliabue Manufacturing Company, Park and Nostrand Avenues, Brooklyn, N. Y. Catalog 1025, "Tag-Mono" instruments for CO_2, $CO+H_2$, etc.

Hoisting Equipment. National Safety Council, Inc., 20 North Wacker Drive, Chicago, Ill. Safe Practices Pamphlet No. 98, on Use and Care of Hoisting Chains.

Stampings. The Geometric Stamping Company, Cleveland, Ohio. A reference work on metal stampings; 28 pages, illustrated with charts, graphs, tables; free by application on firm stationery, mentioning this journal.

Lubrication. Acheson Oildag Company, Port Huron, Mich. Technical bulletin 130.3. Colloidal Graphite as a High Temperature Lubricant. Covers lubrication of oven chains, die casting equipment, etc.

Current News of Associations and Societies

American Foundrymen's Association

1932 Convention at Detroit, May 3-5

The board of directors of the American Foundrymen's Association announces that the next annual convention of the association will be held at the Hotel Statler, Detroit, Mich., May 3, 4, and 5, 1932. This announcement supersedes previous announcement that the annual convention and exposition would be held in Philadelphia, May 2 to 6.

The convention at Detroit will be similar in character to the very successful annual technical and business meeting held at the Edgewater Beach Hotel, Chicago, in 1927, and will be the second time since 1905 that an annual meeting has been held without commercial exhibits.

The A. F. A. also announces that the splendid facilities afforded by the new Convention Hall in Philadelphia have been reserved for the spring of 1933. It is expected that all allied associations and societies which had contemplated meeting jointly with the A. F. A. in Philadelphia will announce that their meetings will be held during the days of the A. F. A. convention in Detroit.

The Program and Papers Committee of the A. F. A. has been unusually fortunate this year in having a wealth of good papers from which to select in organizing the A. F. A. program. These sessions, together with those of other organizations meeting jointly with the A. F. A. at that time will provide such a concentrated meeting as will enable foundry managers, engineers, metallurgists and shop men to get the most value for a minimum of expense and time.

Tentative Program

The tentative program includes the following sessions of interest to nonferrous foundrymen:

Monday, May 2

A. M. and P. M. —Committee Meetings

Tuesday, May 3

9:00 A. M.—Sand Shop Course
10:00 A. M.—Nonferrous Founding
12:30 P.M.—Nonferrous Round Table
4:00 P. M.—Shop Courses
8:00 P. M.—Sand Control

Wednesday, May 4

9:00 A. M.—Sand Shop Course
12:30 P. M.—Pattern Production Round Table
2:00 P. M.—Apprentice Training
4:00 P.M.—Shop Courses

Thursday, May 5

9:00 A. M.—Sand Shop Course
2:00 P. M.—Materials Handling (A.S.M.E. Cooperating)
3:00 P. M—.Business Meeting
4:00 P. M.—Shop Courses

Directory of Metal and Finishing Associations

INFORMATION NOT LISTED CAN BE OBTAINED BY APPLICATION TO METAL INDUSTRY

American Foundrymen's Association, 222 West Adams Street, Chicago, Ill.
American Electroplaters' Society, care of H. A. Gilbertson, 434 South Wabash Avenue, Chicago, Ill. Secretaries of Branches of the American Electroplaters' Society are the following:

Anderson, Ind., R. M. Wagner, 28 West 12th Street.
Baltimore-Washington, I. H. Hahn, 207 South Sharp Street, Baltimore, Md.
Boston, A. W. Garrett, 45 King Street, Dorchester, Mass.
Bridgeport, T. H. Chamberlain, 859 Orange Street, New Haven, Conn.
Chicago. Ill., E. G. Stenberg, 2200 North Kenneth Avenue.
Cincinnati, A. Yeager, 2021 Sherman Avenue, Norwood, Ohio.
Cleveland, P. R. Stamm, 947 Elbon Road, Cleveland Heights, Ohio.
Dayton, Ohio. W. Protsman, 141 Westwood Avenue.
Detroit, Mich., C. M. Phillips, 18933 Hickory Avenue.
Grand Rapids, Mich., J. Van Dyke, 1361 Union Avenue.
Hartford-Connecticut Valley, V. Grant, 32 Jennings Road, Bristol, Conn.
Indianapolis, Ind., L. Mertz, 1725 Union Street.
Los Angeles, Calif., M. D. Rynkofs, 1354 West 25th Street.
Milwaukee, Wis., F. J. Marx, 1431 West Cherry Street.
Montreal, Quebec, Canada, Charles Doherty, 1437 Aylmer Street.
Newark, G. Reuter, P. O. Box 201, Newark, N. J.
New York, J. E. Sterling, 2581 46th Street, Astoria, L. I.
Philadelphia, J. E. Underwood, 327 North 10th Street, Camden, N. J.
Pittsburgh, S. E. Hedden, 227 Fifth Street, Aspinwall, Pa.
Providence-Attleboro, J. H. Andrews, 19 Rosedale Street, Providence, R. I.
Rochester, N. Y., C. Griffin, 24 Garson Avenue.
San Francisco, Calif., H. W. McKibben, 310 Tehama Street.
St. Louis, C. T. McGinley, 8214 Fairham Avenue, University City, Mo.
Toledo, J. M. Lee, Barker Street, Fremont, Ohio.
Toronto, Canada, H. W. Graham, 102 Robina Avenue.
Waterbury, W. F. Guilfoile, P. O. Box 961, Waterbury, Conn.
Worcester, Mass., R. H. Bryant, 94 Grove Street.

International Fellowship Club, T. A. Trumbour, Metal Industry.
Institute of Metals Division, A.I.M.E., 29 West 39th Street, New York City.
American Electrochemical Society, Columbia University, New York City.
American Society for Testing Materials, 1315 Spruce Street, Philadelphia, Pa.
Institute of Metals (Great Britain), 36 Victoria Street, Westminster, London, S. W. 1, England.
Electroplaters' and Depositors' Technical Society (Great Britain), Northampton Polytechnic Institute, St. John Street, London, E. C. 1, England.

Electrochemical Society

The Electrochemical Society will hold its 61st meeting April 21, 22 and 23, at Remsen Hall, the chemistry building of Johns Hopkins University, Baltimore, Md. Aside from the scientific and technical sessions, elaborate preparations are under way for the social entertainment of visiting members and their guests.

Electrolytic Copper and Its By-Products

Dr. Lawrence Addicks, of international fame, will preside at the session on Copper and Its By-Products, to be held on Thursday morning, April 21st, at the Hotel Lord Batimore. Among the subjects to be discussed are the new electrolytic copper plants, selenium, arsenic, the Cottrell precipitator, etc.

Electric Furnace and Its Products

Mr. J. T. MacKenzie, Chairman of the Electrothermic Division will preside at this symposium, to be held on Friday, April 22nd at the Lord Baltimore Hotel. There will be papers on the arc furnace, induction furnace, and on a number of products including ferro-alloys, silicon carbide, and others. The session will be opened by Dr. John A. Mathews, first Joseph W. Richards Memorial Lecturer (see below). Following him President Stoughton will de-

liver his Presidential Address on the Electric Furnace Steels.

Electrodeposition

Prof. H. S. Lukens, of the University of Pennsylvania, will preside at the session to be devoted to the Electrolytic Refining and Plating of Metals. This session will be held at Johns Hopkins University. Directly preceding this session Prof. Donald H. Andrews of Johns Hopkins will discuss some of the researches in science now being carried out at Johns Hopkins.

Industrial Plant Trips

Thursday afternoon and Friday morning will be devoted to the inspection of the following plants in and about Baltimore:

The U. S. Industrial Alcohol Company, Davison Chemical Company, American Smelting and Refining Company, Emerson Drug Company, Standard Oil Company, American Refractory Company, Howard Refractory Company, and the Bethlehem Steel Company, Standard Guano Company.

American Electroplaters' Society

Convention News

The Twentieth annual convention of the American Electroplaters' Society will be held June 20, 21, 22 and 23, 1932, in the Crystal Ballroom of the Benjamin Franklin Hotel, Philadelphia, Pa.

Past-president George Gehling, 5001 Tulip Street, Philadelphia, has been appointed director of the convention. He will have charge of all arrangements, and will seek to assure greatest welfare of all who attend, being assisted in this work by the following committees, any of which may be addressed in regard to the phase of the convention it covers:

HOTELS—Ed. Homan, 4620 North Boudinot Street, Philadelphia, and Otto Mott.

PLANT VISITS—Jos. L. Dinan, 124 North Pennock Street, Highand Park, Pa.

REGISTRATION—Joseph E. Underwood, 327 North 10th Street, Camden, N. J.

BANQUET—Samuel Barr, 711 North 19th Street, Philadelphia.

LADIES' ENTERTAINMENT—J. J. Basch, 310 Wesley Building, Philadelphia.

MEN'S ENTERTAINMENT—Warren Reynolds, 807 Hellerman Street, Philadelphia.

The Entertainment Committee will work in conjunction with the Entertainment Committee of the International Fellowship Club.

Educational Sessions

The educational program has been divided into three sections, as follows:

TECHNICAL DIVISION—Papers from colleges and technical societies. Dr. Hiram S. Lukens, Harrison Laboratory, U. of P., Philadelphia, Pa., chairman.

INDUSTRIAL DIVISION—Papers from industrial and chemical plants, associate members, etc. Dr. A. K. Graham, Harrison Laboratory, U. of P., Philadelphia, Pa., chairman.

ACTIVE MEMBERS' DIVISION—Papers from active members of the Society, reports of Research Committee and Research Associate, Educational Bureau and district chairmen. Samuel T. Lunbeck, foreman plater, Speakman Mfg. Co., 3304 Washington Street, Wilmington, Del., chairman.

. . .

The general committee has decided that no evening educational session will be held. The time which has at past conventions been spent in picnics will be devoted to plant visits. Entertainment of high calibre is being prepared for the evenings.

The registration fee this year will be $1. No advertising program is being printed.

We cordially invite everyone to plan their vacation for June 20 to 23 at Philadelphia.

GEORGE GEHLING,
Convention Director.

Newark Branch

The annual educational session and banquet of the Newark Branch will be held at the Elks' Club, Newark, N. J., on Saturday, April 2. Details as to the program of papers, the banquet and entertainment are being arranged and a good session and great entertainment is assured to all who attend.

The session will begin promptly at 2:30 P. M. Philip Sievering will preside and a very good program of papers is being prepared. Platers, chemists, manufacturers and others interested in plating and finishing are urged to attend.

Guests who intend to come to Newark for the annual meeting and who desire to stay over are advised that they can obtain very good single room accommodations at the Elks' Club, and double rooms at the Douglas Hotel, both in Newark. The Elks' Club is the usual place for holding the annual meeting of the branch, and the Douglas Hotel is very conveniently located. Horace Smith, 208 N. 3rd Street, Newark, N. J., will arrange accommodations on request.

ARRANGEMENT COMMITTEE.

American Die Casting Institute

The American Die Casting Institute, which was organized in 1929 with 15 charter members, now has 22 members, whose sales in normal times represent about 85 per cent of the total U. S. die casting business.

Of chief interest the past year was the proposal of the Institute to undertake a survey of the industry with a view to effective economic planning. The co-operation of the Department of Commerce at Washington will be available in this work. The industry's problems will be given thorough study, with a view to insuring stability.

Another phase of the organization's activities is its research program, in co-operation with the Case School of Applied Science, Cleveland. All phases of die casting metallurgy are being studied.

Headquarters are in care of H. R. Rinehart, secretary, 505 Arch Street, Philadelphia, Pa.

Waste Material Dealers

The National Association of Waste Material Dealers, Inc., will hold its annual convention March 14-16, at the Hotel Astor, New York. There will be sessions of all divisional organizations. The Metal Division will hold its annual meeting March 15 at 2 P. M. Plans for the future activities of the Division will be discussed. Possible reorganzation of this section of the association as a Secondary Metal Association will be discussed in a paper by Thomas A. Wright, secretary-and technical director of Lucius Pitkin, Inc., New York. The plan presented by Mr. Wright will be placed under the consideration of a special committee of representatives of all branches of the secondary metal trade, including dealers, refiners, salvagers, etc.

George Birkenstein of S. Birkenstein and Sons, Inc., Chicago, Ill., has been nominated for the office of president of the National Association. Headquarters of the Association are at 1109 Times Building, New York. Charles M. Haskins is secretary.

Penna.-Atlantic Seaboard Hardware Association

W. M. Reber was elected president of the Pennsylvania and Atlantic Seaboard Hardware Association at the concluding session of a four-day convention in Philadelphia. Other officers selected were: Frank P. Fifer, first vice-president; Walter T. Massey, second vice-president; James T. McCullough, third vice-president; Glenn Pearce, secretary.

The advisory board consists of: William H. Banning, H. S. Newcomer, Frank A. Hegner, George C. Brown, Harry D. Kaiser, Robert J. Murray and John A. Ditz.

American Oil Burner Association

American Oil Burner Association, 342 Madison Avenue, New York, announces the ninth annual Oil Burner Show will be held April 11 to 16 at Boston, Mass. Plans include two merchandising and one engineering session, besides scheduled manufacturers' and dealers' meetings. Considerable exhibition space has already been let on contract, it is stated. This includes reservations by Chase Brass and Copper Company and Detroit Lubricator Company.

International Chemical Exhibition

Following the recent exhibition of chemical apparatus in London, which was in part stimulated by the success of the Achema exhibitions organized by the Dechema, the German Society for Chemical Apparatus, a

project is now being considered for a similar enterprise in Paris in 1932. The Achema has received from the Société de Chimie Industrielle, of France, the proposal that these exhibitions should be held alternately in each of the three countries concerned. This arrangement would have the advantage not only of avoiding the simultaneous occurrence in different countries of such exhibitions, but also of affording opportunities for the mutual study and comparison of methods of production in the different countries. The project was discussed in London and Paris by the founder and director of the German Achema, Max Buchner, and was approved by all parties.

The prospects are that an international exhibition will be held in Paris in 1932 followed by the German exhibition of chemical apparatus (Achema VII) in Cologne in 1933.

National Metal Exchange

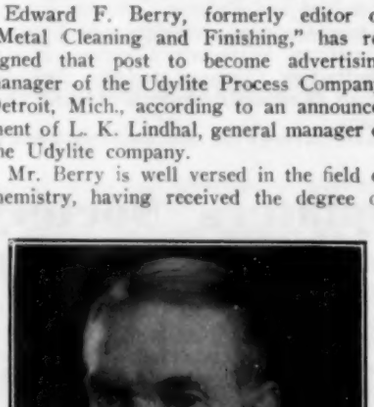
The National Metal Exchange, New York, met January 30 for the annual election. Ivan Reitler of the Federated Metals Corporation, New York, was re-elected president. Other officers are as follows: A. B. Hall, National Lead Company, first vice-president; C. B. White, White Bros. Smelting Corp., second vice-president; M. H. Wehncke, Brandels, Goldschmidt and Company, treasurer. Governors: Leo Auman, American Metal Company; Harold L. Bache, J. S. Bache & Company; J. Chester Cuppia, of E. A. Pierce & Company; Benno Elkan, of International Minerals & Metals Corp.; Paolino Gerli, E. Gerli & Co., Inc.; Floyd Y. Keeler, Orvis Bros. & Company; Jerome Lewine, H. Hentz & Company; Kuo Ching Li, Wah Chang Trading Company; Irving J. Louis, E. J. Schwabach & Company; Marshall W. Tuthill, Tuthill & Company; Erwin Vogelsang, Lewis Lazarus & Sons of N. Y., Inc.

Personals

Edward F. Berry

Edward F. Berry, formerly editor of "Metal Cleaning and Finishing," has resigned that post to become advertising manager of the Udylite Process Company, Detroit, Mich., according to an announcement of L. K. Lindhal, general manager of the Udylite company.

Mr. Berry is well versed in the field of chemistry, having received the degree of



Edward F. Berry.

bachelor of science from the University of Pittsburgh in 1926, and then gone with the Aluminum Company of America as research chemist at New Kensington, Pa. He remained there until 1929, when he took over the editorial position mentioned above.

The Udylite Process Company is widely known as licensor of the "Udylite" cadmium plating process for application of corrosion-preventing coatings to metals.

Edmund C. Mayo, president and general manager, Gorham Manufacturing Company, has been elected a director of Providence (R. I.) Gas Company.

Alfred M. Smith has been elected president and treasurer of Tubular Products Company, Southington, Conn., recently reorganized. Firm manufactures automobile brass tubes, ignition parts, specialties, etc., operating tool room, cutting-up shop, stamping, soldering, brazing, plating, polishing, grinding, lacquering and japanning departments.

W. A. Rosenberger has been appointed chief engineer of the Pangborn Corporation, Hagerstown, Md., manufacturers of sand blast and dust collecting equipment. Mr. Rosenberger was born in Switzerland; graduated from the Zurich Polytechnikum in 1909 and came to this country. He became associated for years with the steel and foundry industries, for 20 years specializing in blast cleaning and dust collecting equipment. He has invented considerable machinery for these purposes, and is well known throughout the industry.

H. S. Kimball, former president of Remington Arms Company, and before that president of American Zinc, Lead and Smelting Company, is now vice-president and member of the board of the Illinois Zinc Company, Chicago.

Adolph Weiss, formerly general manager of the Tottenville Copper Company, Tottenville, Staten Island, New York, has opened an office in room 303, Raritan Building, 175 Smith Street, Perth Amboy, N. J., where he will conduct a business in new and old metals.

Obituaries

John W. Slattery

John W. Slattery, for the past eight years foreman of the finishing department of the Steele and Johnson Company, Waterbury, Conn., died January 16, 1932, at the age of seventy. He was a veteran of the electroplating industry, having been identified with it for more than fifty years.

Mr. Slattery was born in Norwich, Conn., and early in his career in the finishing field he became foreman of the finishing department of the Norwich Nickel and Brass Company. In 1918 he became associated with the Cornwall and Patterson Company, Bridgeport, Conn. Besides his active industrial career, Mr. Slattery was keenly interested in the advancement of the plating science, and he was an active member and a past-president of the Bridgeport Branch of the American Electroplaters' Society.

Mr. Slattery is survived by his son, Thomas F. Slattery, of the U. S. Bureau of Standards, Washington, D. C., who is president of the Baltimore-Washington Branch of the American Electroplaters' Society.

James W. Brown

News comes as we go to press of the death of James W. Brown, electrical equipment manufacturer, of St. Louis, Mo., on February 18, 1932. Mr. Brown was widely known in the plating generator business, having served for more than six years with the Chandeysson Electric Company, and for about a year with Westinghouse Electric and Manufacturing Company. He then started his own company. His untimely death deprives the plating industry of one of its most extraordinary benefactors, as the developments he made in low voltage generators and kindred equipment had already earned for him the appreciation of the trade. A more complete obituary will appear in the next issue.

Frederick Woodruff

Frederick Woodruff, president of the Searls Manufacturing Company, Newark, N. J., died February 14, 1932. The Searls company is a large manufacturer of saddlery hardware.

Nathan M. Carl

Nathan M. Carl, vice-president of the Buckeye Brass Company, Cleveland, Ohio, died January 14, 1932, after a long illness.

Industrial and Financial News

New Phelps Dodge Copper Products Subsidiary

Phelps Dodge Corporation, New York, will operate its manufacturing business through two separate subsidiaries after March 21, 1932, it is announced by Louis S. Cates, president. The present fabricating subsidiary, National Electric Products Corporation, will designate hereafter only the company's National Metal Molding Division, and will have headquarters at Pittsburgh, Pa., in charge of W. C. Robinson, president. A new corporation, Phelps Dodge Copper Products Corporation, headed by Wylie Brown, president, will take over and operate the other fabricating divisions, including American Copper Products Division, Bayway, N. J., producing copper wire bars, rods, wire, cable, brass wire and cable, weatherproof wire, etc.; British American Tube Division, Bayway, making pipe and tube; Inca Mfg. Division, Ft. Wayne, Ind., maker of coils, magnet wire, radio transformers; P-G-M Metal Division, maker of fabricated shapes in copper and alloys with special corrosion resisting and high physical properties. Habirshaw Wire and Cable Corp., of which Mr. Wylie is also president, continues as a subsidiary of Phelps Dodge Copper Products Corp. Both of these companies are removing on March 21 to 40 Wall Street, New York, where Phelps Dodge Corporation has headquarters. Phelps Dodge is one of the three largest American producers of copper.

Metals for Ammunition

The following table shows the consumption of metals in ammunition manufacture in United States during the past three years, as computed by the American Bureau of Metal Statistics, in short tons:

	1929	1930	1931
Copper	6,867	5,137	4,977
Zinc	2,563	1,838	1,800
Lead	35,008	29,479	24,311
Totals	41,140	33,271	29,732

These totals do not include metals used by army and navy for their own manufacture, which is relatively small.

Ohio Foundry Accidents

Seventy-two accidents, two of which proved fatal, occurred in Ohio non-ferrous foundries during January, according to Robert Hoierman of Cleveland, secretary of the Ohio Foundries Association. The monthly report of the Ohio Industrial Commission which shows a total of 300 foundry accidents in the state for the first month this year, compared with 498 for the same period in 1931 and 394 for December, 1931.

Non-ferrous accidents during January, 1932, showed a decrease over January and December, 1931. There were 74 non-ferrous accidents in January, 1931, and 102 in December. The average for all of 1931 was 80 accidents per month.

Non-ferrous plants are taking an active part in the state-wide safety campaign being staged by the Ohio Foundries Association in an effort to reduce the number of accidents. Reports received since the campaign began last November 1, show 133 accidents, an average of an accident for each 25,487 man hours worked.

Schwab Still Cheerful

Charles M. Schwab, chairman of the Bethlehem Steel Corporation, who celebrated his seventieth birthday last month, expressed a cheerful view of future business conditions. "I can't see anything but ultimate prosperity and success," he said. "I have been building mills for years, and I never built a mill I did not think was too big, and I never built a mill that did not turn out too small. There may be a long period of depression, but I am sure that the normal consumption of the American public is going to be much greater than it is today."

Aluminum Company Cuts Dividend

Directors of the Aluminum Company of America, Pittsburgh, Pa., have voted a dividend of 75 cents on preferred stock for payment April 1, instead of $1.50 heretofore paid. It was stated that while sales the past two years have declined in common with the general business condition, production has been kept above sales requirements, which policy will be continued for the present to avoid increased unemployment. Another factor is hydroelectric power which is purchased under contracts which cannot be altered, as well as company-owned power requiring small operating charges which cannot be altered. It is expected that with a reasonable increase in sales and decrease in inventories, arrears on the preferred stock, which is cumulative, will be rapidly paid.

Brass Ingot Business

On February 1st, unfilled orders for brass and bronze ingots and billets on the books of the members of the Non-Ferrous Ingot Metal Institute, Chicago, amounted to a total of 20,014 net tons, according to an announcement of the Institute.

The Institute reports the average prices per pound received by its membership on commercial grades of six principal mixtures of ingot brass during the twenty-eight day period ending February 26, as follows:

Com. 80-10-10 (1% Impur.)	7.476c
Commercial 78%	5.724c
Commercial 81%	6.017c
Commercial 83%	6.196c
Commercial 85-5-5-5	6.611c
Commercial No. 1 Yellow Brass	4.803c

R. & H. Safety Show

Over 2,500 employees and members of their families attended the second annual R. and H. Safety Show, held in the interest of safety and welfare by the Niagara Plant of The Roessler and Hasslacher Chemical Company, Inc., New York City, in Niagara Falls, N. Y., on February 9, 10 and 11. This show included feature acts and demonstrations by R. and H. employees, addresses on safety by plant executives, and the presentation of awards to departments with meritorious safety records. On the last night of the show, the announcement was made that in January the R. and H. Niagara Plant had won the du Pont General Manager's prize for operating over a period of approximately 264 days without a lost-time accident. At the time of the show, the period worked without a lost-time accident was 285 days, representing over 2,000,000 man hours.

Acts in which employees participated included musical and dance numbers, and first-aid demonstrations by two crack plant first-aid squads. Cups were awarded to five departments for especially good safety records during the past year, and certificates were given to 21 other departments which had 100% safety records. The speakers at the show were Dr. E. A. Harding, development division manager; Leslie M. White, manufacturing division manager, and Donald O. Notman, service division, who stressed safety in home life, in community life, and in the factory. Arrangements for the show were made by a committee headed by Dr. G. E. Lewis.

Corporation Reports

National Lead Company—net profits of $4,022,421 for 1931, against $4,675,098 1930.

American Metal Company—net loss of $615,909 after charges for 1931, against net profit of $1,827,578 for 1930.

Vulcan Detinning Company—net profit of $255,635 for 1931, against $335,734 for 1930.

Landers, Frary and Clark—net 1931 profit, $711,772, against $1,064,661 for 1930.

General Bronze Corporation—net loss of $559,968 for 1931, against net loss of $969,299 for 1930.

Driver-Harris Company—net loss of $202,778 for 1931, against net profit of $359,568 for 1930.

General Cable Corporation — Year ended December 31: Net loss after interest, depreciation, shrinkages in market values of materials and reserve for revaluing various inventory items $5,271,551, against a net loss of $2,067,951 in 1930.

Aluminum Goods Manufacturing Company—Net profit for 1931: $906,-

225, or $73,784 less than in 1930, George Vits, president, announced. He added that the directors considered it advisable to reduce the quarterly dividend payable on April 1 by 15 cents a share. The dividend paid in 1931 was $1.20 a share.

Oneida Community, Ltd. — Year ended January 30: Net loss after depreciation, taxes, interest and inventory reductions, $532,785, against net loss of $398,673 in preceding year. Loss for 1931 was exclusive of $79,860 discount on foreign exchange and Canadian and British assets.

Baltimore Tube Company—Year ended Dec. 31: Net loss after depreciation, reserves and inventory adjustments, $175,894, against net loss of $141,776 in 1930.

International Nickel Company took no action on its common stock dividend at the meeting held Feb. 15. Robert C. Stanley, president, in a statement to stockholders, said that whether or not common dividends can prudently be paid for the year now current will depend upon developments which cannot be foreseen.

United States Foil Company—Year ended Dec. 31: Net profit after expenses and Federal taxes, $739,899, against $942,191 in 1930, exclusive of $56,101 other income and deduction applicable to prior years.

New Jersey Zinc Company—Year ended Dec. 31: Net income after depreciation and taxes $3,051,589, compared with $5,013,403 in 1930.

Federal Metals Corporation — Year ended Nov. 30: Net loss after interest and depreciation, $1,489,897, against a net loss of $676,488 in preceding year.

Parker Rust-Proof Company—Year ended Dec. 31: Net profit after charges and Federal taxes, $449,070, against $455,220 or $4.52 a share on 97,631 shares in 1930.

United Engineering & Foundry Company—Year ended Dec. 31: Net earnings $953,708, compared with net of $2,114,359 in 1930.

News From Metal Industry Correspondents

New England States

Waterbury, Connecticut

MARCH 1, 1932.

William H. White has been elected president of the **Waterbury Clock Company,** one of the two positions held by the late C. W. Curtiss, who died in January. No appointment was made to office of general manager, also held by Mr. Curtiss. It is understood that the directors are considering several applications and that when they select some one for general manager, Mr. White will resign and the one selected will also be elected president. Mr. White, it is understood, merely volunteered to fill the gap pending the selection of a permanent head.

Plume and Atwood Manufacturing Company used $150,000 from its surplus last year to maintain its dividends, the annual report shows. The net earnings were $23,837, but dividends of $175,000 were paid, thereby reducing the surplus as of January 1, 1931, from $1,826,649 to $1,675,487 on January 1, 1932. The report shows no accounts or bills payable at the end of the year, the only liabilities being the capital stock of $1,250,000, the dividends declared for the coming year of $100,000, a reserve for contingencies and taxes of $50,000, leaving a surplus of $1,675,487. Assets given consist of cash, $17,269; accounts and bills receivable, $542,797; bonds, $445,946; stock in other companies, $131,042; merchandise, $909,235; plant, $1,029,195. The actual value of the plant is generally considered far in excess of this figure.

Patents were granted to local inventors last month as follows: **George Boden,** rights on a self locking pin fastener, assigned to the **Scovill Mfg. Co.; Albert P. Hodge,** time and coin controlled apparatus, assigned to the **William L. Gilbert Clock Co.,** Winsted; **Herbert Jennison,** electric conductor, assigned to the **American Brass Co.**

Sales plans for the coming year were discussed at a two-day conference of salesmen of the **Ingersoll-Waterbury Clock Co.** from all over the East, held here last month. **Allan L. Daniell,** manager of the company, **G. A. Roskam,** sales manager, and **C. R. Hoffman,** advertising manager, were in charge of the meeting. Mr. Daniell and Mr. Hoffman also had charge of a similar conference of the western representatives of the company in Chicago last month. The concern is the selling organization of the Waterbury Clock Co. —W. R. B.

Connecticut Notes

MARCH 1, 1932.

Hartford.—**Edward R. Grier,** former president of the **Arrow, Hart & Hegeman Electric Co.,** was elected chairman of the board at the annual meeting last month. **John R. Cook,** former vice-president, was made president. Other officers were reelected.

Underwood Elliott Fisher Co. directors declared a quarterly dividend of 50 cents a share payable March 31 to stock of record March 12. The previous dividend was 75 cents and a year ago it was $1.

John T. Chidsey, former president and treasurer of **Veeder Root, Inc.,** was elected chairman of the board at the annual meeting last month. **Graham H. Anthony,** former vice-president, was elected president. **Edward H. Crosby** was elected vice-president in place of **Ralph C. Coxhead,** vice-president and director, who resigned. **Charles G. Allyn,** former assistant treasurer, was elected treasurer. **John H. Chaplin** and **Harvey L. Staunberg** were reelected secretary and assistant secretary, respectively. **L. Brooks Leavitt** and **Charles T. Treadway** resigned as directors. **Edward H. Ingraham** of Bristol, **John H. Chaplin** and **Samuel M. Stone** were elected directors. The officers reported that the operating profit for 1931 exceeded that for 1930, even on decreased sales. Net income before federal taxes was $14,105. Current assets were $659,633 and current liabilities, $76,161. Capital and surplus as of December 31, 1931, was $2,368,892 compared with $2,285,853 at the same date a year ago.

Bridgeport.—The plant, grounds, patents, good will and trade name of the **Locomobile Company of America, Inc.,** once one of the largest and most prosperous automobile concerns in the country, were sold at a foreclosure sale here last month, to Fred D. Corey of Buffalo, N. Y., representing the bondholders of the company, for $200,125. Of this, only $125 was for the patents, good will and trade name. The rest, $200,000, was for real estate valued at $1,000,000. There was no competitive bidding. The property consists of a waterfront, 10 large buildings and a number of smaller ones with over an acre of land.

Connecticut Electric Mfg. Co. assets were ordered sold to **Industrial Managers, Inc.,** New York, for $175,000, by the bankruptcy court last month. Some months ago, it was proposed to merge this concern with the **Beardsley & Wolcott Mfg. Co.,** Waterbury, under the direction of Industrial Managers, at a valuation for the local company of $300,000. This deal was blocked by the court. Although the stockholders of Beardsley & Wolcott approved a merger, the business of the Waterbury company is said to have so improved since that time that they are now no longer willing to go through with it. Consequently, the sale of the local concern to the Industrial Managers, will not affect the Waterbury concern.

Bristol.—All officers and directors of the **Bristol Brass Corp.** were reelected at the annual meeting last month.

Winsted.—Officers and directors of the **William L. Gilbert Clock Co.** were elected last month as follows: President, **Norman F. Thompson;** vice-presidents, **R. E. Thompson** and **N. L. Stevens;** secretary and treasurer, **R. J. Leighton;** directors, Norman F. Thompson, Mrs. M. F. Thompson, R. E. Thompson, R. J. Leighton, O. G. Williams, Allen Hubbard, Jr., N. L. Stevens, W. H. Phelps.

American Knife Co. expects to move

from the building of the B. J. Harrison Chair Co. to land of its own on Lake Stream, where it has water privileges with two wheels, forge shop, storehouse and boiler house, erected 30 years ago as the site for the grinding works of the Winsted Scythe factory. The American Knife Co. is the only one left of the three pocket knife concerns which made the name of Winsted famous in bygone years.

New Britain.—American Hardware Corporation, through the **P. & F. Corbin Division,** has the contract to furnish the hardware for the "Radio City" in New York. The ultimate amount will constitute the largest hardware order ever placed, and the immediate business is a substantial order. Those in charge of construction have standardized the specifications for hardware. No specially designed materials will be required for the present.

Torrington.—Officers of **Fitzgerald Mfg. Co.** were elected at the annual meeting last month as follows: President, **P. J. Fitzgerald;** treasurer, **M. F. Fitzgerald;** vice-president, **M. D. Fitzgerald;** secretary, **B. J. Peck.** These four were also elected directors. Two semi-annual dividends of 4 percent each for the coming year were declared.

Thomaston.—John Dick, a 50-year employee of the **Seth Thomas Clock Co.,** for 16 years superintendent of the case department, retired February 1. The executives, department heads and employees of his department gave him a reception at which gifts were presented to him and later entertained him at dinner in Waterbury.

Meriden.—International Silver Co. has declared a dividend of $1 a share on the preferred, payable April 1 to stock of record March 14. This is a reduction as the usual preferred dividend is $1.75.

Norwalk.—Segal Lock Co. plans to bring additional manufacturing units to Norwalk so that all production can be centralized here. W. R. B.

Springfield, Mass.

MARCH 1, 1932.

In comparison with the figures issued last month by 26 metal working concerns in western Massachusetts, the number of persons employed has risen from 12,267 to 12,560. This gain, it is felt among the concerns which showed the largest increase in employment, was not due primarily to seasonal developments, but to a definite feeling among local manufacturers that an upturn of a permanent nature has occurred in the industries.

While production at the **Indian Motocycle Company** has not reached the point set at the first of the year, progress is being made rapidly, and by the March 1 production is expected to have reached the 100 unit mark. Many of the new type machines have already been placed upon the market, and a large order from the Pennsylvania state police bureau has kept the concern on a full time basis.

Reorganization plans at the **Bosch Magneto** plant has brought a temporary slump in their activities here, but by the first of the month it is believed that the plans will have been completed and the firm will be back on a larger schedule than previously, due to large orders from several of the automotive plants.

Bausch Machine and Tool Company reports that while activities have been running smoothly for the past few weeks, there has been no great amount of business, but that by the first of April the volume of orders will be such that a large increase in the payroll will without any doubt be necessary.

During the past two months business at the **Westfield Manufacturing Company** has been rather quiet, but during the past week orders have been coming in with such rapidity that the next three months promise to be the most active quarter in more than a year.

Westinghouse Electric's plans for increased production have been realized, and activity at the plant is mounting rapidly. G. B. Y.

Middle Atlantic States

Central New York

MARCH 1, 1932.

Encouraging reports from the **Savage Arms Corporation,** where former employes are being put back to work, was about the only bright light in the nonferrous metal picture in the Central New York area this month.

At the **Utica Industrial Association** office, where charts for the entire state are kept, it was reported that about 1,000 persons are working in the metal trades at Utica, while in Rome about 3,900 persons are employed. The association officials figure that Utica is at about 54 per cent of normal, while the whole district including Rome and Utica is at about 67 per cent of normal. The latter figure, as compared with about a year ago, shows the district is down about 6 per cent.

While the metal trades have been suffering a decline, figures for all industry in this area show an increase of 5 per cent to 75 per cent normal, against a 70 per cent average at this time last year.

Savage Arms Corporation on February 3 announced it was taking men back to work. The fact that in the previous few days Savage stock jumped from $3 to $7 was indicative that something was stirring at the arms plans. Plant officials, asked if war in the Orient was responsible for the jump in stock prices and putting men back to work, said the company no longer made machine guns or other war pieces, confining that part of their business to sporting arms only.

This was followed by a report that a large block of common stock of the Savage Arms Corporation has been purchased privately at a price above the current market value. Outstanding common stock of the company now has a market value of approximately $1,000,000, compared with the purchase price of $1,500,000 paid by Savage Arms to Westinghouse Electric after the war for **J. Stevens Arms Company,** one of the wholly owned subsidiaries of Savage Arms.

With this report came the rumor that recalling of men to work had been linked to the possibility of the War Department diverting orders from government arsenals to manufacturing companies to make the latter plants ready for exigencies.

A portable feed grinder which can be mounted on trucks is one of the items being pushed by **Bossert Corporation,** Utica, where metal parts of all kinds are made. **Gilbert Butler,** corporation officer, said the grinder was one of the promising items on the company's list at present.

At the **Horrocks-Ibbotson** plant, where fishing tackle is manufactured, it was reported that a current batch of large orders had required putting on extra help.

Rome, heart of this section's copper industry, showed slight improvement although officials of the larger plants held out hopes that an upward turn in business might soon develop, but no one was willing to predict the date of such upturn. E. K. B.

Newark, New Jersey

MARCH 1, 1932.

A receiver has been appointed for **Allsopp and Allsopp, Inc.,** manufacturing jewelers, at 18 Columbia Street. **George B. Astley** was named to take over the jewelry concern, and interested parties were ordered to show cause why he should not continue to liquidate the company. The company was incorporated Aug. 2, 1906. Assets were valued at $75,000, but it was not stated they would bring such a sum at a forced sale. Liabilities were said to total about $56,000, and it was stated the company lacks capital to continue.

Kieley & Meller, Inc., a ninety-year-old New York concern, has purchased a manufacturing plant on Niagara Street. The company manufactures steam specialties.

Roessler & Hasslacher Chemical Co., Perth Amboy, N. J., denies the rumor that it is transferring its manufacturing activities to its plants in other towns. **C. L. Wiswall,** superintendent of the Perth Amboy plant, says the rumor was due to the transferring of some of the staff to the Niagara Falls works. He declares the company will remain in Perth Amboy.

Newark concerns recently incorporated are: **Becht & Hartl, Inc.,** manufacture jewelry, $125,000. **George L. Vogel, Inc.,** refining metals, $100,000. **Thor Electric Clock Corp.,** manufacture tower clocks and registers, 2,500 shares common. **Metal Compounds Corp.,** metals, 100 shares common. **General Controls Corporation,** manufacture time clocks, 1,000 shares no par. **Barbastroke Company,** manufacture razor blades, 100 shares. C. A. L.

Trenton, New Jersey

MARCH 1, 1932.

Some of the metal manufacturing plants here are operating four days a week, while others are running but three.

John A. Roebling's Sons Company is giving employes thirty-two hours a week at the Trenton and Roebling, N. J., plants.

Annandale Graphite Corporation is progressing with plans to reopen its plant, and the hoisting tower at the mine is nearing completion. For some time men have been working on the new shafts and building the tower site and the refining building. The shaft will be driven fifty feet deeper and will pass under the vein of graphite. The vein is said to be from five to forty per cent pure. **Harold D. Tonkins** of Clinton is general manager of the plant.

United Lead Company, Maurer, N. J., is planning to build a factory at South Amboy to cost $40,000.

Solfo Chemical Company, 821 Pennington Avenue, Trenton, is planning for a new unit that will add 1,500 feet of floor space. The company has gained national recognition through the manufacture of chemical products important to the electric sign and metal products industries.

New concerns incorporated here are: **Bergen Art Metal Works, Inc.,** Englewood, metal novelties, 1,000 shares common. **Simpson Manufacturing Company,** Union City, manufacture electrical appliances, $30,000. **H. V. Walker Company,** Elizabeth, chemicals, $120,000. **J. Goldberg, Inc.,** Perth Amboy, metal products, $50,000. —C. A. L.

Middle Western States

Detroit, Michigan

MARCH 1, 1932.

Conditions in the nonferrous metal field have changed but little during the last four weeks, particularly in the Detroit area. This has proved more or less of a disappointment, and is causing anxiety. It was thought that soon after the motor car shows manufacturing in the Detroit plants would gain activity rapidly. But things are not turning out quite as expected. Manufacture of automobiles and accessories is still spasmodic. But there is hope that this may change soon for the better. The **Ford Motor Company** announced its plans for the coming months, which include an eight, a four, and increased production. This relieves some of the hesitancy of competitors and buyers also. The next four or six weeks may see the present quiet conditions change into something more encouraging.

Manufacturers of automobile accessories, at present, are producing only moderately. The plating industry is practically in the same condition—marking time and awaiting future developments.

Production of plumbing and steam fitting supplies shows no change from a month ago. Conditions are quiet in this field and the future more or less uncertain.

Manufacturing jewelers are decidedly quiet. Some of them are at a standstill. No one can accurately forecast the immediate future.

Kelvinator shipments during January were 23 per cent in excess of those for the same period in 1931, and 12 per cent over those of 1930. **H. W. Burritt,** vice-president in charge of sales, says that "the continued maintenance of the upward curve in our business I attribute to buying on the part of prospects who were practically sold during the comparison campaign of last season, and to the nation-wide advertising and sales promotion work of the Electric Refrigeration Bureau."

Unit shipments of the **Norge Corporation,** division of the **Borg-Warner** organization, during January were more than twice those of the corresponding month a year ago, notwithstanding the fact that 1931 was the best year in the history of Norge, according to **H. E. Blood, president.**

Lucius B. Manning, a vice-president of the **Cord Corporation,** Chicago, has been named president of the **Stinson Aircraft Corporation,** Wayne, Mich., taking the place of Eddie Stinson, who was killed a short time ago in a crash. The Stinson company is one of the subsidiaries of Cord.

DeVaux-Hall Motors Corp., Grand Rapids, Mich., manufacturers of the DeVaux car, has filed a voluntary petition in bankruptcy. The petition requested a receivership "to safeguard the interests of the creditors." **George R. Scott,** vice-president in charge of production, and **Frank G. Deane,** of the Grand Rapids Trust Company have been named as temporary receivers. Liabilities are listed as $1,830,112.14 and assets as approximately $2,000,000, with unsecured claims of $1,345,819.41 and secured claims of $437,700. It is expected the corporation's business will be carried on without interruption.

A. J. Peoples, vice-president and manager of the **American Brass Company** branch at Detroit, will direct the convention of the National Association of Credit Men at the Statler Hotel in Detroit during the week of June 20. Some 25,000 wholesale, manufacturing and banking credit executives from all sections of the country comprise the membership of the association. F. J. H.

Cleveland, Ohio

MARCH 1, 1932.

Prospects for an improvement in business in this area in the near future have grown definitely better during the last four weeks, according to statisticians of the Union Trust Company, here. Four outstanding events are cited as having improved the outlook: Formation of the Reconstruction Finance Corporation; the Glass-Steagall banking measure; acceptance of the ten per cent wage reduction by railroad employes; and announcement of plans for a start in production by the Ford Motor Company.

Production in the non-ferrous metal field at present is still dragging, with no pronounced change within the last month. Some of the accessory plants are producing moderately, but not at the speed that was anticipated a few weeks ago. Now that some of the uncertainty in the motor car field has been dispelled by the announcement of plans from the Ford Motor Company, the outlook for the next few weeks looks more promising.

With production speeded up in the accessory plants, plating will show a corresponding improvement. This field has been more or less dormant for the last several months.

Between 400 and 500 workers were recalled in January by the Willys-Overland plant at Toronto. At the parent plant in Toledo a similar speeding up in production is reported. F. J. H.

Wisconsin Notes

MARCH 1, 1932.

Roy M. Jacobs, president-treasurer of the **Standard Brass Works,** Milwaukee, has been re-elected a director of the Milwaukee Employers' Council of that city.

All officers of the **Sheet Metal Contractors' Association** of Wisconsin were re-elected at the concluding session of the annual convention held in Milwaukee, Feb. 1 and 2. President is **R. G. Suettinger,** Two Rivers.

An increase in authorized capital from $50,000 to $150,000 and expansion of its manufacturing facilities has been announced by the **Alloy Products Corporation,** manufacturers of stainless steel products for the dairy, food, packing and chemical industries, which recently moved its plant to Waukesha, Wis. The company's new plant at Waukesha will enable it to nearly double its present capacity. President is **Walter J. Wachowitz.**

Max C. Hermann, salesman for the **Aluminum Goods Manufacturing Company,** Manitowoc, was married recently to Miss Ethel M. Sawyer in San Francisco. Mr. Hermann is a native of Manitowoc, but was transferred to the west coast several months ago.

Exhibitors at the annual convention of the Wisconsin Retail Lumbermen's Association held at the Milwaukee Auditorium, Jan. 16, 17 and 18, included the **Aluminum Company of America** and the **American Zinc Institute.** The convention was well attended with a registration of approximately 1,200. A. P. N.

Pacific Coast

Los Angeles, Calif.

MARCH 1, 1932.

California's tin can manufacture and consumption runs into large figures. The total value of canned products for the state runs to $380,000,000 a year, divided in several large categories including $60,000,000 worth of fish, or over half of the total U. S. canned fish output; $32,000,000 worth of canned milk, or about a sixth of the country's total; 30,600,000 cans of fruit and vegetables, which is six times as much as all other western states combined put up, and a fifth of the total U. S. production. Naturally, the canning industry requires many products besides the tin plate cans. Much solder is used, and a great deal of paper and wood for packing. Cans alone run into about $29,000,000 a year.

Brass was the principal material for a mechanical heart produced by **Dr. P. J. Hauzlik** of Stanford University. The heart was put into an animal from which the normal organ had been removed and it worked perfectly. It is used to study the effects of drugs and dyes on the blood.

Chrysler Corporation is building a $2,000,000 car and truck plant at East Ninth Street, to take over all Pacific Coast and foreign Pacific activities. The plant will have 316,000 sq. ft. of floors, and will turn out 200 pleasure cars daily, as well as a good number of trucks.

Central Plating Company, 239 South Spring Street, reports a good amount of gold and silver plating work on hand.

Wildberg Bros., San Francisco and Los Angeles, reports it is very busy at its five-acre refining plant in San Francisco, refining platinum, gold, silver, etc. The company is constantly widening its activities, and is now rolling most of its own silver sheet instead of buying in the East as formerly.

Central Machine Company, 1401 South Los Angeles Avenue, **J. A. Hampton,** superintendent, is being kept busy right along. The firm specializes in producing models and inventions in quantity, working in all metals, and operating complete working, finishing and plating departments.

J. T. De Nault, 3754 Lima Avenue, has begun manufacture of brass rings for holding street electric light globes without screws, to eliminate cracking of glass by screws.

Universal Filter Company, 3636 South Hope Street, is busy producing large lots of filters for all types of faucets.

W. W. Partridge will manufacture spray guns in a plant just started at 741 Henry Street.

Alta Metal and Mfg. Co. has started business at 1072 Golden Gate Avenue, San Francisco. **J. S. Sisco** is manager.

Artco Mfg. Co. has opened a shop at 416 Webster Street, Oakland, to make curtain brackets. **Gene Hall** and **Sanky Oren** are owners.

B. F. Sturtevant Co. will erect plant at Berkeley for manufacture of ventilating, heating, refrigerating and air conditioning apparatus, vacuum cleaners, motors, etc. **E. F. Foss** is president.

Crown Cork and Seal Company, Baltimore, Md., has bought the **Western Stopper Company,** 25th and Patrero Avenue, San Francisco. Plant manufactures bottle caps, etc.

Verbeck and Rambaud have started business of working platinum for jewelry, at Shreve Building, San Francisco.

Aluminum Industries, Inc., Cincinnati, Ohio, has opened a large warehouse at 1148 South Olive Street, Los Angeles, and expects to have good orders for aluminum pistons for the cars to be turned out at the aforementioned Chrysler plant beng erected here.

K. E. Sedlecek is busy at his plant producing solid silver trophies, etc.

Porter Blanchard, Burbank, Cal., is active on pewter trophies and cups.

West Bearing Company has begun erection of a $25,000 plant at 12th and Everett Streets, Portland, Ore.

Fisher Governor Co., Marshalltown, Iowa, has opened an assembly plant at 1015 Santa Fe Avenue, Los Angeles, in charge of **Roy McKoy.**

Starr Piano Co., Richmond, Ind., has purchased the electric refrigerator concern, **Benedict & Co.,** Los Angeles, and has spent $250,000 on a new plant at 2867 West Pico Street. **H. L. Nolder** is secretary and treasurer.

Guyton Lock Co., 716 Chapman Building, Los Angeles, will manufacture locks.

F. N. Eaton, 1106 Meriden Avenue, Alhambra, is manufacturing signs for advertising and display purposes.

Kenwood Co., 1232 South Grand Avenue, is handling metal specialties. Some of its lines are made up by **Scovill Mfg. Co.,** Waterbury, Conn. H. S.

Other Countries

Birmingham, England

FEBRUARY 16, 1932.

The outstanding event of this month is the **British Industries Fair,** the heavy section of which was held as usual at Birmingham at the end of the month. Trade has been in need of a stimulus, and manufacturers are hoping that order books will be strengthened as a result. There was a good display of metals, both raw and worked up, and practically all the prominent non-ferrous rollers of Birmingham and district were represented. In addition there was an excellent display of aluminum ware of all kinds.

Trade among brass founders is rather quiet. British makers have, of course, welcomed the new era of tariffs, but invariably it is regarded as a beginning and nothing more. They will want a much more detailed and constructive program of protection before they are satisfied. Brass foundry products for domestic use, and particularly that sold to builders, are adversely affected at the moment by the stringency of the times. The nation's purse strings have been tightened and this has resulted in the postponement or abandonment — temporarily, it is hoped — of housing schemes. Manufacturers and merchants are having to hang on to stocks of material which were produced in readiness for such projects. Buyers made contracts on a lavish scale in October and November following the abandonment of the gold standard and when most people thought there would be a distinct advance in metal prices. That has not happened. Copper prices are today easier than they were two months ago. Consequently buyers are now asking for postponement of deliveries.

Brass founders are doing very little export trade and this is a matter of serious concern. The Colonies are almost closed to British makers at present. Australia and New Zealand are taking very little. India is sending a few enquiries, but brass founders here are dubious about accepting the business and the general unrest in that country makes it difficult to open negotiations. A few orders are coming from the Far East, but here again political quarrels militate against any broadening of the market.

The Birmingham Jewelers' and Silversmiths' Association, in expressing pleasure at the introduction of tariff proposals, points out that the 10 per cent duty is totally inadequate for the industry. They express the hope that no time will be lost by the Government in creating a scientific tariff, pointing out that during the interval there will be a very large importation of foreign articles.

The Midland Council of the **National Union of Manufacturers** has passed a resolution welcoming the Government's tariff policy. They recognize it is a foundation upon which an effective and useful tariff structure can be built.

The Twenty-fourth Annual Meeting of the **Institute of Metals** will be held in the Hall of the Institution of Mechanical Engineers, London, on Wednesday and Thursday, March 9 and 10. There will be an innovation in the proceedings in that while the ordinary business and the reading of papers will occupy the first day and the morning of March 10, the second afternoon's session will be devoted to a general discussion on "The Testing of Castings." The discussion of such a practical question has been planned by the Council in order to interest all sections of the Institute's membership—those engaged in practical foundry work, engineering users of castings and testing and investigation experts. The discussion will be opened with a short paper by **Dr. W. Rosenhain, F.R.S.,** a past-president of the Institute. J. A. H.

Business Items—Verified

El Paso Sheet Metal Works, 118 W. Franklin Street, El Paso, Texas, expects to go into the plating business, according to **William Poppenhusen,** proprietor.

Pacific Brass Foundry, 528 Folsom Street, San Francisco, Calif., manufacturer of brass, bronze and aluminum castings, is now casting "Everdur" and "Shaw" metal.

Sparkling Burner Corporation, 20 Pratt Street, Fitchburg, Mass., will manufacture and sell range oil burners. This firm operates the following departments: brass machine shop and tool room.

Superior Metal Products Co., St. Paul, Minn., recently exhibited products at the Minnesota Industrial Exhibition. Company operates spinning, stamping, tinning, soldering, arc welding departments.

Farrel-Birmingham Company, Inc., held its annual meeting last month, re-electing **Franklin Farrel, Jr.,** chairman of the board; **Nelson W. Pickering,** president; and all other officers and directors.

Whitehead Metal Products Company has removed its Boston, Mass., office to larger and more convenient quarters at 235 Bridge Street, Cambridge, Mass. It was formerly at 67 Washington Street, North Boston.

Detroit Brass and Malleable Works, Detroit, Mich., has finished improvements to its nonferrous foundry. Company also operates brass machine shop, grinding, plating, polishing, japanning departments. **G. B. Baldwin** is vice-president and sales manager.

Medina Iron and Brass Company, Medina, N. Y., has been organized with **William J. Kirby** as president and chairman of the board. Other officers: **William A. Munson,** vice-president; **J. D. Johnson,** secretary-treasurer; the officers comprise the board of directors.

Metropolitan Square Corporation, New York, has awarded contracts for vertical aluminum panels for the ten buildings in its development, to the **Aluminum Company of America.** The buildings will require 22,000 spandrels requiring 3,000,000 pounds of aluminum.

Flint Scrap Iron and Metal Company, 806 W. Second Street, Flint, Mich., has been incorporated with $50,000 capital, to deal in and prepare non-ferrous and ferrous metals. **Louis S. Lebster,** 2112 Miller Road, and **M. W. Fishler,** 513 E. Paterson Street, Flint, are the incorporators.

M. L. Oberdorfer Brass Co., Syracuse, N. Y., held its annual meeting in February, re-electing **Joseph L. Goodman,** president; **H. P. Digney,** vice-president; **J. M. Scott,** secretary; **Jesse L. Oberdorfer,** treasurer. Board of directors consists of **M. O. Goodman, R. O. Bronner, D. B. Sugarman.**

D. L. Auld Company, Fifth Street and Fifth Avenue, Columbus, Ohio, is manufacturing a wide variety of metal products, including considerable material for the aviation industry. The company operates tool room, stamping, zincing, soldering, plating, polishing and lacquering departments.

Lea Manufacturing Company, Waterbury, Conn., has begun in the present issue of METAL INDUSTRY a series of advertisements in which specific methods of finishing metals and metal products will be given. The information will be of interest to polishers and finishers, and the Lea company expects that the information will be compiled for future reference.

Robertson Lead Manufacturing Co., 6251 Lafontaine Street, Montreal, Que., has awarded contracts for construction of an addition to its present plant, 30 x 80 ft. This will be used as secondary and dross metals department, operations to start in March. Company's plant is equipped to produce lead products and will handle about 1,000 tons monthly for the present.

Ellison Bronze Co., Inc., Falconer, N. Y., held its annual stockholders' meeting recently, re-electing **E. H. Ellison** president. Other officers chosen are **R. B. Ellison,** vice-president; **A. C. Nordstrom,** secretary-treasurer; **F. O. Ellison,** assistant secretary. Company operates complete nonferrous foundry and machine shop, stamping, plating and finishing departments.

McAleer Manufacturing Company, Detroit, Mich., producer of polishing and cleaning compounds, reports actual shipments to jobbers in January, 1932, were 18.4% greater than in the same 1931 month. **C. H. McAleer,** president, is confident 1932 business will be good, and says that orders on hand for spring shipment are larger than at any time in the firm's history. A good part of the output is for the automotive trade.

Concord Silversmiths, Inc., Concord, N. H., which was organized in 1931 by employes of the former Durgin Division of Gorham Manufacturing Company, is in active operation, producing sterling silverware. Firm operates following departments: tool room, casting shop, spinning, stamping, soldering, polishing. Recently a "stockholder's visit" to the plant was attended by 300 people.

Foundry Equipment Company, Cleveland, Ohio, has purchased the business of **McCann-Harrison Company,** manufacturers of conveyor hearth and standard furnaces for annealing, normalizing, heating, etc., and will operate the business as the **McCann-Harrson Division** of the Foundry Equipment Company, with offices and plant at 1831 Columbus Road, Cleveland.

Tubular Products Company, Southington, Conn., manufacturer of brass tubing for automobiles and aircraft, has been purchased by a group of Southington men who plan equipment revamping and purchases. The following departments are operated: tool room, cutting-up shop, spinning, stamping, soldering, brazing, plating, polishing, grinding room, lacquering, and japanning.

Walworth Company is concentrating at Kewanee, Ill., and Greensburg, Pa., the manufacture of brass valves and fittings formerly handled from Boston factory, according to an announcement by **A. J. Mather,** vice-president and manager of Kewanee unit. Patterns and a small part of the finishing equipment is being transferred. The following departments are operated: brass foundry, brass machine shop, plating, polishing, and grinding room.

American Machine and Metals, Inc., 100 Sixth Avenue, New York, has purchased the Tolhurst Machine Works, Inc., Troy, N. Y., manufacturer of metal washers, extractors, etc. Founded in 1852 by W. H. Tolhurst, the company at Troy has specialized in making centrifugal equipment for a great many years. The Tolhurst firm will continue to operate as a separate subsidiary, with general sales and executive offices at the New York address of the American Machine Company.

Fairmont Foundry and Manufacturing Company, Fairmont, W. Va., recently organized to take over local foundry interests, contemplates improvements in plant, including installation of monorail cranes, core furnace, coke oven, portable grinders and other equipment, as business conditions warrant. **Lewis J. Carskaden,** 311 Leona Court, is president and general manager. The following departments are operated: brass, bronze and aluminum foundries; brass machine shop, tool room, casting shop, and grinding room.

New Companies

Lehman Sprayshield Company, 2514 North Broad Street, Philadelphia, Pa.; to take over and expand company of same name, making plumbing supplies, radiator enclosures, etc.; capital, $50,000; by L. H. Lehman and H. E. Stern.

Metallurgical Products Company, Philadelphia, Pa., has been organized by I. W. Wilenchik, who for 20 years operated in scrap metals at Philadelphia as Industrial Metal Company, having sold his interest in the latter firm to Industrial Metal Co., Inc., Newark, N. J.

D. & W. Sprinkler Manufacturing Company, Athol, Mass.; to manufacture sprinkler valves and fire protection apparatus; Arthur H. Starrett of L. G. Starrett Tool Company, president; C. H. Cook, treasurer; Merwin Kessler, general manager and superintendent of Athol Machine Company, secretary.

Metal Market Review

By R. J. HOUSTON

D. Houston and Company, Metal Brokers, New York

MARCH 1, 1932.

Copper

Considerable activity developed in the copper market in February especially for export account. New lows were registered for both foreign shipment and domestic delivery. Volume of business increased substantially with European consumers at the more attractive buying figures. Lower prices met with a prompt response from abroad, and sales during the first half of the month were notably heavy. The domestic demand was on a moderate scale even at the recent concessions.

There were three price declines during February in the export price. The downward trend set in early in the month by a reduction from 7⅛c to 6⅞c c. i. f. European ports. Subsequent reductions to 6¾c and 6⅝c respectively were established before the middle of the month. Meanwhile the local market dropped to 6 cents Connecticut delivery. Following in the wake of these developments, and owing to indications of constructive movements, the export price has been advanced to 6⅝c and the domestic basis to 6¼c delivered. American and European producers are again giving careful study to the world position of copper in the effort of improving conditions in the industry. Obviously the peculiar circumstances surrounding the entire situation call for specific and quick action. The export price dropped to 6⅜c c. i. f. European ports on February 24. Further conferences by American and foreign producers are going on at present.

Copper developed a weaker tendency and a new export price of 6⅛c has been established with moderate sales at that figure. The domestic level is again down to 6 cents delivered to Connecticut points and dull at that.

A complete shut down at mines and refineries is advocated in U. S., but foreign producers have not been won over to this constructive measure, according to latest reports.

Zinc

Further price recessions occurred in zinc during the past month, and at the recent low price of 2.80 cents a pound at East St. Louis market values of Prime Western slab zinc touched the lowest point in history. Dull trading and restricted inquiry being in evidence early in the month reactionary sentiment developed. Volume of business at this juncture was not sufficient to prevent a downward trend, and a desire to liquidate metal for prompt shipment forced the market lower by a slight fraction. During the second half of the month there was a slight recovery from the bottom. The market was quoted steady at 2.85c East St. Louis and 3.22c New York. Sales of Prime Western on this basis recently were in fairly good volume. Stocks of slab zinc on Feb. 1 were 129,886 tons, compared with 129,825 the month before and 145,076 tons a year ago.

Tin

A moderate amount of tin changed hands in this market during the past month. No broad participation among buyers was in evidence, however, most of the time, and after a period of price fluctuations in the first fortnight of ¾ of a cent a pound the market lapsed into a comparatively quiet but fairly steady condition. Opening prices for prompt Straits tin were 22.10 cents. A little show of firmness lifted the quotation to 22.25c but from that point the tone gradually drifted downward until the price touched 21.50c on Feb. 10. Influenced by the firmer developments in Wall Street and the more optimistic sentiment generated in financial circles, the market turned firm advancing to 22.30c on Feb. 17. A moderate business was done at the higher levels, but inquiry was not sustained in sufficient volume to carry prices upward.

Lead

Interest in the lead market lately was maintained on a substantial scale, but current demand was not active enough to lift prices above 3.55c East St. Louis and 3.75c New York. Producers were able to keep the price at this level during the last half of February, although a limited tonnage was sold in the western section of the market at 3.50c St. Louis basis. Consumers confined most of their orders to nearby shipments, and recent business was for carload quantities. Total bookings in February, however, reached good proportions. Production in January was 8,877 tons in excess of the shipments for that month. Stocks of refined lead at smelters in the United States on February 1 amounted to 160,257 tons, and compare with 113,145 tons on February 1, 1931, an increase of 47,112 tons. Overproduction and heavy surplus stocks tells the story of sub-normal prices.

Aluminum

Consumption of aluminum is absorbing a fair tonnage each month. Demand, however, is less than under normal conditions. No changes have occurred in the price basis, but production schedules are readily correlated with requirements so that excessive and unwieldy surplus stocks are avoided. The aluminum industry, therefore, is in a unique position. Erratic price movements and uncertain market conditions are consequently practically unknown for primary aluminum. Production and use of aluminum has increased greatly in recent years. The dominant interest is pushing its claims in the transportation field. These efforts are meeting with success in railroad circles, besides creating many miscellaneous new outlets for the pure metal and its alloys.

Antimony

There was a spurt of activity in the market for antimony early in February and Chinese regulars advanced about a cent per pound to 7 cents duty paid. The unsettled conditions in China restricted both offers and shipments from that country and were responsible for some aggressive buying on the way up from 6⅛c to 6¾c. Later, a firmer tone developed on scarcity of offerings, and asking price was advanced 7c to 7⅛c, duty paid. The activity proved to be a brief flurry, and in a short time the market relapsed in a dull and lifeless condition. Offerings increased lately, and at present Chinese regulus for prompt delivery quotes 6¾ cents a pound, duty paid at New York.

Quicksilver

No unusual news of special importance is reported to change the quotation for quicksilver. Prices are quoted at $65 to $66 per flask, and in some cases $67.

Platinum

Refined platinum has been steady for several weeks past at $37.50 per ounce. There are no indications at present of any special change in the price trend.

Silver

The bullion price of silver in New York touched a new high for this year of 31 cents per ounce, up 1¾ cents from January low. The high last year was 37¼c and the low 25¾c. There is a determined effort being made to counteract the process of deflation in silver and restore it to a place in the monetary systems of the world. An impartial study of the question is strongly recommended by leading interests, and it is likely that something will eventually be done to stabilize silver and put it on a monetary rather than a commodity basis.

Old Metals

Buyers of copper and brass scrap are getting whatever tonnages of this material are available at the lowest prices hitherto quoted. Exporters were recent eager buyers at prevailing prices. The supply, however, at minimum figures is limited as holders are not anxious to part with their stock at the present low level. The movement on sales is therefore restricted. Uncertainty of business and low values have weakened the market and unsettled conditions in all branches of the trade.

The Wrought Metal Business

By J. J. WHITEHEAD

President, Whitehead Metal Products Company of New York, Inc.

MARCH 1, 1932.

Business has improved enough to be noticeable. This is particularly true of brass products, the demand for which, up to this time, has been lagging a little.

The copper situation is apparently still in a state of flux. The adherence to a curtailed production program has had some effect, but because of the decline in consumption of the metal, it is probable that stocks are still increasing. The copper producers are again conferring and from press reports it is probable that the Katanga representatives are in the United States again to attend such conferences. It may be that because of the large stocks of metal further curtailment is essential, or that some of the smaller units of the industry may shut down.

The price of copper is holding fairly steady at around 6¼c to 6½c a pound. This is considerably below average cost of production, and it hardly seems likely that the price will go much lower unless distress metal is thrown on the market, and then the amount will be relatively small.

Probably all metals are in about the same boat in that they must await a revival of general business. Stocks of commodities are relatively large and it is impossible to work them off unless the consumptive demand increases. This is dependent on a revival of business generally. The fact that stocks of metals and other commodities in the hands of manufacturers, jobbers and others are small is a favorable factor. When the pick-up in business comes the demand from these sources will help to accelerate the pace at which it takes place.

Copper and Brass Products

Demand for copper and brass products has shown just the slightest pick up. It looks as if the spring will see a further increased demand. The use of copper and copper products for range boilers and tanks for water heaters has shown a marked increase. This is a logical outlet and ties in well with the use of copper and brass pipe and tube. The use of copper for spandrels either plain or lead coated is another likely outlet for a large tonnage. Research by the copper industry resulting in development of various colors and finishes on its products will go toward increasing the consumption of the metal.

Aluminum is also being specified for spandrel purposes, and the use of this metal for spandrels for Radio City is one of the largest spandrel jobs using metal. The price structure of aluminum and aluminum alloys is holding constant. There is no weakening, and this tends to create a feeling of confidence.

The steady price situation in aluminum is duplicated in nickel and Monel, and from this standpoint these metals have an advantage over copper and its alloys. Considerable research work is underway by nickel interests with an idea of developing new products and new uses.

Business Prospects

Governments and business men the world over have fully recognized the seriousness of the business situation. It is to be noted that tremendously constructive steps are being taken by various Governments, particularly our own, whose far reaching effects cannot at this time be anticipated. Certainly every action is of a constructive character, and started with the hope that ultimately it will greatly improve the situation. Probably, as is always the case, the remedies now being applied will with natural corrective forces bring about a greater revival than anyone at the moment could anticipate.

Daily Metal Prices for the Month of February, 1932

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	2	3	4	5	8	9	10	11	12*	15	16
Copper c/lb. Duty Free												
Lake (Del.)	7.125	6.875	6.875	6.875	6.875	6.875	6.875	6.625	6.625	.....	6.375	6.625
Electrolytic (f.a.s. N. Y.)	7.00	6.75	6.75	6.75	6.75	6.75	6.50	6.25	6.25	.....	6.25	6.25
Casting (f.o.b. ref.)	6.625	6.50	6.50	6.50	6.25	6.25	6.00	6.00	6.00	.....	6.00	6.00
Zinc (f.o.b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	2.85	2.825	2.825	2.80	2.80	2.85	2.85	2.80	2.80	.....	2.85	2.85
Brass Special	2.95	2.925	2.925	2.90	2.90	2.95	2.95	2.90	2.90	.....	2.95	2.95
Tin (f.o.b. N. Y.) c/lb. Duty Free												
Straits	22.10	22.25	21.90	22.00	21.875	21.75	21.625	21.50	21.75	.....	22.25	22.15
Pig 99%	21.50	21.50	21.50	21.50	21.50	21.375	21.30	21.15	21.375	.....	21.875	21.75
Lead (f.o.b. St. L.) c/lb. Duty 2½c/lb.	3.55	3.55	3.55	3.55	3.55	3.55	3.55	3.55	3.55	.....	3.55	3.55
Aluminum c/lb. Duty 4c/lb	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	.....	23.30	23.30
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	35	35	.....	35	35
Shot	36	36	36	36	36	36	36	36	36	.....	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	.....	35	35
Antimony (Ch. 99%) c/lb. Duty 2c/lb	6.125	7.00	7.00	6.80	6.75	6.75	6.75	6.625	6.60	.....	6.60	6.50
Silver c/oz. Troy Duty Free	30.25	29.875	29.50	29.625	29.75	29.625	29.625	29.50	29.625	.....	30.375	30.25
Platinum $/oz. Troy Duty Free	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	.....	37.50	37.50

	17	18	19	22*	23	24	25	26	29	High	Low	Aver.
Copper c/lb. Duty Free												
Lake (Del.)	6.625	6.625	6.625	.....	6.625	6.625	6.625	6.625	6.625	7.125	6.375	6.717
Electrolytic (f.a.s. N. Y.)	6.25	6.25	6.25	.....	6.25	6.125	6.125	5.875	5.875	7.00	5.875	6.382
Casting (f.o.b. ref.)	6.00	6.00	6.00	.....	6.00	6.00	6.00	5.875	5.75	6.625	5.75	6.118
Zinc (f.o.b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	2.85	2.85	2.85	.....	2.85	2.85	2.825	2.80	2.80	2.85	2.80	2.830
Brass Special	2.95	2.95	2.95	.....	2.95	2.95	2.925	2.90	2.90	2.95	2.90	2.930
Tin (f.o.b. N. Y.) c/lb. Duty Free												
Straits	22.30	22.20	22.25	.....	22.25	22.15	22.125	22.10	22.10	22.30	21.50	22.033
Pig 99%	21.95	21.90	21.875	.....	21.875	21.80	21.75	21.75	21.75	21.95	21.15	21.630
Lead (f.o.b. St. L.) c/lb. Duty 2½c/lb.	3.55	3.55	3.55	.....	3.55	3.55	3.50	3.30	3.30	3.55	3.30	3.521
Aluminum c/lb. Duty 4c/lb	23.30	23.30	23.30	.....	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	.....	35	35	35	35	35	35	35	35
Shot	36	36	36	.....	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	.....	35	35	35	35	35	35	35	35
Antimony (Ch. 99%) c/lb. Duty 2c/lb	6.375	6.375	6.375	.....	6.375	6.375	6.375	6.375	6.375	7.00	6.125	6.553
Silver c/oz. Troy Duty Free	30.00	30.00	30.125	.....	31.00	31.00	30.75	30.50	30.875	31.00	29.50	30.118
Platinum $/oz. Troy Duty Free	37.50	37.50	37.50	.....	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50

*Holiday.

Metal Prices, March 4, 1932

(Duties mentioned refer to U. S. tariffs on imports, as given in the Tariff Act of 1930.)

NEW METALS

Copper: Lake, 6.125. Electrolytic, 5.75. Casting, 5.625.
Zinc: Prime Western, 2.80. Brass Special, 2.90.
Tin: Straits, 22.35. Pig, 99%, 22.00.
Lead: 3.05. **Aluminum,** 23.30. **Antimony,** 6.25.
Nickel: Ingot, 35. Shot, 36. Elec., 35. Pellets, 40.
Quicksilver: flask, 75 lbs., $67. **Bismuth,** 85.
Cadmium, 55. **Cobalt,** 97%, $2.50. **Silver,** oz., Troy (N. Y. official price March 7), 30.25.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $37.50 to $40.00.

Duties: Copper, free; zinc, 1¼c. lb.; tin, free; lead, 2½c. lb.; nickel, 3c. lb.; quicksilver, 25c. lb.; bismuth, 7½%; cadmium, 15c. lb.; cobalt, free; silver, free; gold, free; platinum, free.

INGOT METALS AND ALLOYS

	Cents lb.	Duty
Brass Ingots, Yellow	4⅝to 6½	45%
Brass Ingots, Red	6¼to 8½	45%
Bronze Ingots	7 to 9½	45%
Aluminum Casting Alloys	19 to22	4c. lb.
Manganese Bronze Castings	18 to35	45%
Manganese Bronze Ingots	6 to10	45%
Manganese Bronze Forgings	26 to35	45%
Manganese Copper, 30%	17 to25	25%
Monel Metal Shot or Blocks	28	25%
Phosphor Bronze Ingots	7¼to10	45%
Phosphor Copper, guaranteed 15%	10½to14½	3c. lb.
Phosphor Copper, guaranteed 10%	10 to14	3c. lb.
Phosphor Tin, no guarantee	27 to40	Free
Silicon Copper, 10%	17 to35	45%
Iridium Platinum, 5%	$42.00	Free
Iridium Platinum, 10%	$44.00	Free

OLD METALS

Dealers' buying prices, wholesale quantities	Cents lb.	Duty
Heavy copper and wire, mixed	3¾to 4	Free
Light Copper	3¼to 3½	Free
Heavy yellow brass	1⅞to 2	Free
Light brass	1½to 1¾	Free
No. 1 Composition	3⅛to 3⅜	Free
Composition turnings	3 to 3⅛	Free
Heavy Soft lead	2⅛to 2⅜	2⅛c. lb.
Old Zinc	1 to 1⅛	1½c. lb.
New zinc clips	1½to 1¾	1½c. lb.
Aluminum clips (new, soft)	11½to12½	4c. lb.
Scrap aluminum, cast, mixed	3½to 4	4c. lb.
Scrap aluminum sheet (old)	8½to 9	4c. lb.
No. 1 pewter	12½to13½	Free
Electrotype and Linotype	2¼to 2¾	2⅛c. lb.*
Nickel anodes	21½to22½	10%
Nickel sheet clips; rod ends (new)	23½to24½	10%
Monel scrap	6½to 7½	3c. lb.

* On lead content.

Wrought Metals and Alloys

The following are net BASE PRICES per pound, to which must be added extras for size, shape, small quantity, packing, etc., as shown in manufacturers' price lists, effective February 25, 1932.

COPPER MATERIAL

	Net base per lb.	Duty
Sheet, hot rolled	15⅜c.	2½c. lb.
Bare wire	8½c.	25%
Seamless tubing	14⅞c.	7c. lb.
Soldering coppers	15⅞c.	45%

NICKEL SILVER (NICKELENE)

Net base prices per lb. (Duty 30% ad valorem.)

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	21c.	10% Quality	24⅛c.
15% Quality	23¼c.	15% Quality	28⅛c.
18% Quality	24½c.	18% Quality	31⅝c.

BRASS MATERIAL—MILL SHIPMENTS

Net base prices per pound

Net per lb.	High Brass	Low Brass	Bronze	Duty
Sheet	12½c.	13⅝c.	14c.	4c. lb.
Wire	12½c.	13⅝c.	14c.	25%
Rod	10¼c.	13⅝c.	14c.	4c. lb.
Brazed tubing	21⅝c.		24⅝c.	12c. lb.
Open seam tubing	20¼c.		21¾c.	25%
Angles, channels	20¼c.		21¾c.	12c. lb.
Seamless tubing	15¾c.		17⅛c.	8c. lb.

TOBIN BRONZE AND MUNTZ METAL

Net base prices per pound. (Duty 4c. lb.)	
Tobin Bronze Rod	14c.
Muntz or Yellow Metal Sheathing (14"x18")	14⅝c.
Muntz or Yellow Rectangular sheet other sheathing	14⅝c.
Muntz or Yellow Metal Rod	11¼c.

ALUMINUM SHEET AND COIL

(Duty 7c. per lb.)

Aluminum sheet, 18 ga., base, ton lots, per lb.	32.30
Aluminum coils, 24 ga., base price	30.00

ROLLED NICKEL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Net Base Prices

Cold Drawn Rods	50c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finished Sheet	52c.

MONEL METAL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	40	Cold Rolled Sheets (base)	50

SILVER SHEET

Rolled sterling silver (March 7) 33.50c. per Troy oz. upward, according to quantity. (Duty free.)

ZINC AND LEAD SHEET

	Cents per lb. Net Base	Duty
Zinc sheet, carload lots, standard sizes and gauges, at mill, less 7 per cent discount	9.00	2c. lb.
Zinc sheet, full casks (jobbers' price)	9.25	2c. lb.
Zinc sheet, open casks (jobbers' price)	10.00to10.25	2c. lb.
Full Lead Sheet (base price)	6.75	2½c. lb.
Cut Lead Sheet (base price)	7.00	2½c. lb.

BLOCK TIN AND BRITANNIA METAL SHEET

(Duty free)

This list applies to either block tin or No. 1 Britannia Metal Sheet, No. 23 B. & S. Gauge, 18 inches wide or less; prices are all f. o. b. mill:

500 lbs or over ..... 15c. above N. Y. pig tin price
100 to 500 lbs. ..... 17c. above N. Y. pig tin price
Up to 100 lbs. ..... 25c above N. Y. pig tin price

Lighter gauges command "extras" over the above prices.

Supply Prices, March 4, 1932

ANODES

Copper:	Cast	17½c. per lb.
	Rolled, sheets, trimmed	16¾c. per lb.
	Rolled, oval	14 c. per lb.
Brass:	Cast	17 c. per lb.
Zinc:	Cast	10½c. per lb.
Nickel:	90-92%	40c. to 45c. per lb.
	95-97%	42c. to 46c. per lb.
	99%	44c. to 48c. per lb.

Silver: Rolled silver anodes .999 fine were quoted March 7 from 33.50c., per Troy ounce upward, depending upon quantity.

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 50 lbs.	50 to 100 lbs.	Over 100 lbs.
10-12-14 & 16	1" to 2"	$3.00/lb.	$2.75/lb.	$2.65/lb.
10-12-14 & 16	2 to 3½	3.00	2.70	2.50
6-8 & over 16	1 to 3½	3.10	2.85	2.70-2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 to 6	¼ to 3	4.85	4.85	4.85
4 to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

On grey Mexican wheels deduct 10c. per lb. from White Spanish.

COTTON BUFFS

Full disc open buffs, per 100 sections, when purchased in lots of 100 or less:

11" 20 ply 64/68 Unbleached	$13.37 to $14.45
14" 20 ply 64/68 Unbleached	21.60 to 23.70
11" 20 ply 80/92 Unbleached	17.00 to 17.55
14" 20 ply 80/92 Unbleached	26.37 to 28.90
11" 20 ply 84/92 Unbleached	21.69 to 21.90
14" 20 ply 84/92 Unbleached	35.37 to 36.15
11" 20 ply 80/84 Unbleached	21.69 to 21.90
14" 20 ply 80/84 Unbleached	35.37 to 36.15

Sewed Pieced Buffs, per lb., bleached ..... 41c. to 70c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.09¾-.14
Acid—Boric (Boracic) Powdered	lb.	.08⅛-.09½
Chromic, 75 to 400 lb. drums	lb.	.13½-.17½
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls.	lb.	.08
Nitric, 36 deg., carboys	lb.	.06-.06½
Nitric, 42 deg., carboys	lb.	.07-.08
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	14.30-21.70
Denatured drums	gal.	.35½-.43½
Alum—Lump, barrels	lb.	.03¼-.04
Powdered, barrels	lb.	.03½-.04
Ammonia, agua, 26 deg., drums, carboys	lb.	.03½-.05
Ammonium sulphate, tech., bbls.	lb.	.03½-.05
Sulphocyanide	lb.	.28-.37
Arsenic, white, kegs	lb.	.04½-.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.58
Borax Crystals (Sodium Biborate), bbls.	lb.	.04½
Cadmium oxide, 50 to 1,000 lbs.	lb.	.55
Calcium Carbonate (Precipitated Chalk)	lb.	.05¾-.07½
Carbon Bisulphide, drums	lb.	.05½-.08
Chrome Green, bbls.	lb.	.20
Chromic Sulphate	lb.	.30-.40
Copper—Acetate (Verdigris)	lb.	.23
Carbonate, bbls.	lb.	.14-.20
Cyanide (100 lb. kgs.)	lb.	.39
Sulphate, bbls.	lb.	.038-.05¼
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.20¼-.20½
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar, bags	lb.	.04½
Gold Chloride	oz.	$12.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.32-.34
Iron Sulphate (Copperas), bbls.	lb.	.01½
Lacquer Solvents	gal.	.85
Lead Acetate (Sugar of Lead)	lb.	.13¼
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Methanol, 100% synth., drums	gal.	.41½
Nickel—Carbonate, dry bbls.	lb.	.32
Chloride, bbls.	lb.	.18-.19½
Salts, single, 300 lb. bbls.	lb.	.10½-.13
Salts, double, 425 lb. bbls.	lb.	.10½-.13
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash Caustic Electrolytic 88-92% broken, drums	lb.	.06¾-.08½
Potassium Bichromate, casks (crystals)	lb.	.08½
Carbonate, 96-98%	lb.	.06¾
Cyanide, 165 lbs. cases, 94-96%	lb.	.50-.60
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.04½-.05¾
Silver Chloride, dry, 100 oz. lots	oz.	.27¼
Cyanide (fluctuating)	oz.	.35
Nitrate, 100 ounce lots	oz.	.23¾
Soda Ash, 58%, bbls.	lb.	.023
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.16½-.22
Hyposulphite, kegs, bbls.	lb.	.03½-.06½
Metasilicate	lb.	.05-.06¼
Nitrate, tech., bbls.	lb.	.03¼-.07
Phosphate, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls.	lb.	.01½
Stannate	lb.	.21½
Sulphocyanide	lb.	.28-.45
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.25½-.27
Tripoli, powdered	lb.	.03
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls.	lb.	.11
Chloride, drums, bbls.	lb.	.07½-.10
Cyanide (100 lb. kegs)	lb.	.38
Sulphate, bbls.	lb.	.03½